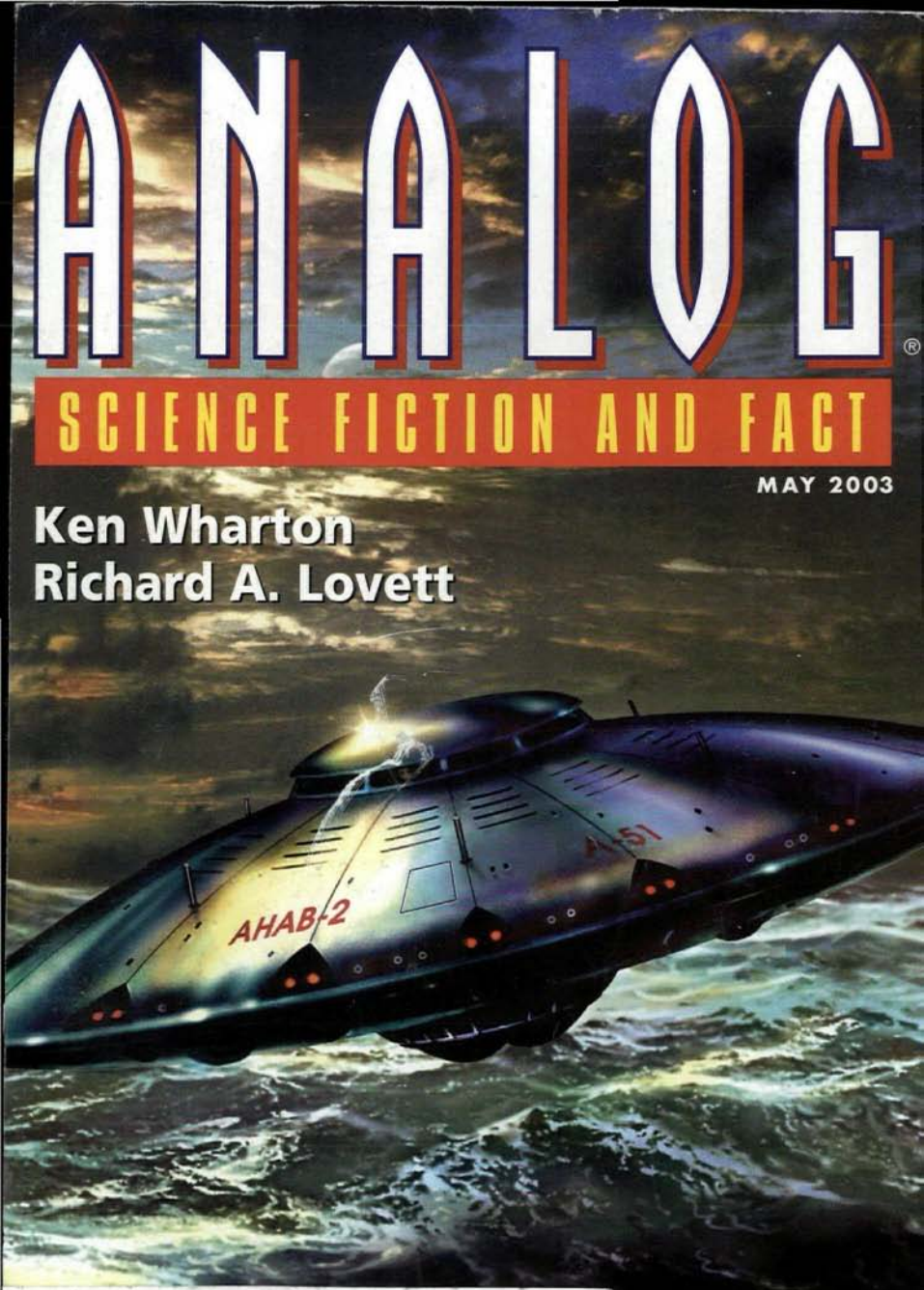
ANALOG

SCIENCE FICTION AND FACT

MAY 2003

Ken Wharton

Richard A. Lovett



APR 05
WALTER CUIRLE
2430 AVON RD
ARDMORE PA 19003-2601
#BXNDCNB ******** 3-DIGIT 190
#CIR2430A098 1#647724
DD
BLNC
#0091

Rajnar Vajra

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Be in Style...
with Heavy Cotton T's from

Asimov's SCIENCE FICTION and **ANALOG** SCIENCE FICTION AND FACT

Mail to: Dell Magazines Direct • 6 Prowitt St.
Suite Promo T • Norwalk, CT 06855-1220

Asimov's Science Fiction T-Shirt (AST)

SOLD OUT ____S SOLD OUT ____M ____L ____XL ____XXL **$9.99 each** $_____

Analog Science Fiction & Fact T-Shirt (ANT)

SOLD OUT ____S SOLD OUT ____M ____L ____XL SOLD OUT ____XXL **$9.99 each** $_____

Shipping & Handling _____ x $2 $_____
(Add $2 per T-shirt or $6 for three or more.
Deliverable to US addresses only) **Total:** $_____

❑ Enclosed is my payment. Please charge my: ❑ VISA ❑ MASTERCARD

CARD #_____ EXP. DATE: ___ / ___

CARDHOLDER'S SIGNATURE_____

NAME _____

ADDRESS _____

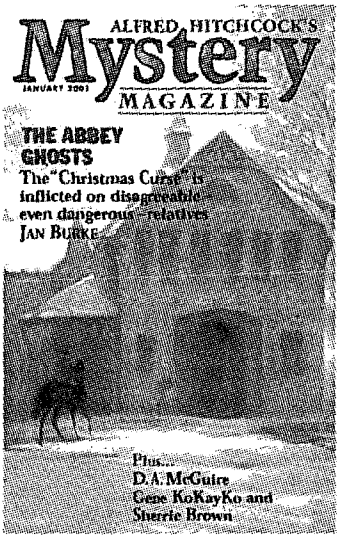
CITY _____ STATE_____ ZIP_____

Order online or mail the order form with your payment today.

NSTS62

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

SOME PEOPLE WOULD KILL...FOR A COPY



But you don't need to! Subscribe to Alfred Hitchcock's Mystery Magazine and you won't miss a single issue of all the mystery and intrigue you love. Each year you'll enjoy 10 issues of 144 pages and one double issue of 240 pages delivered directly to your door.

Act now and take advantage of this special introductory offer,
6 issues for just $9.97!
Enjoy the convenience of home delivery and save!

To order by charge card, call toll-free:
1-800-333-3311
Outside the U.S.A.: 1-850-682-7644

BY MAIL

Alfred Hitchcock • P.O. Box 54011
Boulder, CO 80322-4011

Please allow 4 to 6 weeks for delivery of your first issue. Outside USA: Add $4 per year for shipping and handling. All orders must be paid in U.S. funds.
*We publish a double issue once a year which counts as two issues toward your subscription.

5P21

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ANALOG

SCIENCE FICTION AND FACT

Vol. CXXIII No. 5
May 2003

Next Issue on Sale
April 29, 2003

70

80

SERIAL

SHOOTOUT AT THE NOKAI CORRAL (Conclusion), Rajnar Vajra ____ 90

NOVELETTES

THE IMMORTALITY PLAGUE, Steven Bratman ____ 10
THE MONOPOLE AFFAIR, Ken Wharton ____ 46

SHORT STORIES

THE DEATH ADDICT, Larry Niven ____ 60
THE DAY THE TRACK STOOD STILL, John C. Bodin & Ron Collins ____ 70
A GOOD OFFENSE, Don D'Ammassa ____ 80

SCIENCE FACT

THE SEARCH FOR EXTRATERRESTRIAL OCEANS, Richard A. Lovett ____ 36

PROBABILITY ZERO

GET ME TO THE JOB ON TIME, Ian Randal Strock ____ 64

READER'S DEPARTMENTS

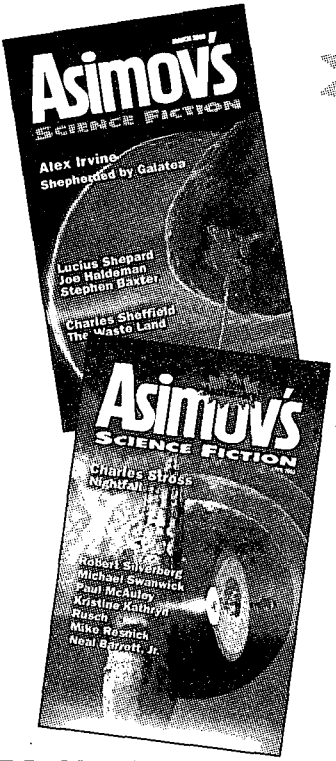
THE EDITOR'S PAGE ____ 4
IN TIMES TO COME ____ 142
THE ALTERNATE VIEW, John G. Cramer ____ 66
THE REFERENCE LIBRARY, Tom Easton ____ 132
BRASS TACKS ____ 138
UPCOMING EVENTS, Anthony Lewis ____ 144

Stanley Schmidt Editor
Cover design by Victoria Green
Indicia on page 5

Trevor Quachri Associate Editor
Cover Art by David A. Hardy
Online Chat Listing on page 35

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

DISCOUNT TIME TRAVEL



Just $6.95!
For 5 Classic Issues

You'll join the vanguard of science fiction when you order our **Asimov's Science Fiction Value Pack**. You get five of our most popular back issues for just $6.95 plus shipping. ***That's a savings of 60% off the regular price!***

Asimov's always delivers the most celebrated authors in the field. Share their visions now with dozens of stories that launch you into the fantastic worlds of tomorrow.

To get your **Asimov's Science Fiction Value Pack,** just complete the order form below and mail it back to us with your payment today.

PENNY MARKETING

Dept. SM-100, 6 Prowitt Street, Norwalk, CT 06855-1220

☑ **YES!** Please send me my **Asimov's Science Fiction Value Pack**. I get 5 back issues for just $6.95 plus $2 shipping and handling ($8.95 per pack, U.S. funds). **My satisfaction is fully guaranteed!** My payment of $_____ is enclosed. (IAPK05)

Name: _____
(Please print)

Address: _____

City: _____

State: _____ **ZIP:** _____

Please make checks payable to Penny Marketing. Allow 8 weeks for delivery. Magazines are back issues shipped together in one package. To keep prices low we cannot make custom orders. Add $4 additional postage for delivery outside the U.S.A. Offer expires 6/30/04. 53C-NN5VL1

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

EDITORIAL Stanley Schmidt

THE GROUND FLOOR

Back when I was in high school, I got my hands on a pile of *Popular Science* and similar magazines from the 1930s and 1940s. In that same general neighborhood of time, I also wandered such museums as the Smithsonian Institution, the Museum of Science and Industry in Chicago, the Crawford Auto-Aviation Museum in Cleveland, the Air Force Museum in Dayton (Ohio), and the Ford Museum in Dearborn (Michigan).

Reading old magazines (especially the ads, oddly enough) is a fascinating way to get a feel for the flavor of a time. A good museum can do the same, even more vividly, since it lets you see and smell and (if the guards are looking the other way) feel the actual objects people of a bygone era used in their daily lives, and try to imagine how it might have felt to use them yourself.

Doing that with the early twentieth century, I often found myself thinking how much fun it would have been to get in on the ground floor of one of the big technological revolutions that reshaped life in developed countries: things like the automobile, aviation, radio, and sound recording. By the time I was growing up, all those things were more or less routine parts of the everyday landscape. It was hard to imagine life without them. Sure, they all continued to evolve, but the changes were refinements of detail, not revolutions in concept. Cars got faster, rode smoother, developed conveniences like automatic transmissions and power steering, and went longer between oil changes. Airplanes went faster, higher, and farther, and learned to fly in almost all kinds of weather. Radio sound quality and reliability improved; sound recordings came in smaller packages and delivered more realistic sound. But they were all still doing basically the same thing they started out doing, only better. Cars were still a way to get people and cargo from point A to point B; airplanes did the same thing, only faster; radio still transmitted sounds from one place to another, and recordings saved them for future listening.

In the early days, there was a fundamental difference: Every year, every month, sometimes every day, people were doing things that had never been done at all. At the very beginning of aviation, nobody had ever been off the ground in a powered, heavier-than-air device. A little later, nobody had ever flown coast to coast, or across an ocean. The earliest sound recordings were remarkable not because they were so good, but because they existed at all; nobody in all of prior history had ever had or heard one. And human beings were making these things happen. It must have been exciting, I thought, to live in a time when so many things of such radical novelty were being done. Even if you weren't one of the people actually doing them, there must have been a considerable vicarious kick in seeing them done, and knowing that they were being done by people at least somewhat like yourself, and that soon you, too,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

would be able to benefit from the new abilities they conferred.

Furthermore, the earliest ventures into a new technological arena had *character*. By the time I was growing up, the cars and planes and radios and phonographs of any period were pretty much alike, regardless of who made them. By then the best available ways of making those things were pretty generally known, and everybody used them. Sure, there were minor cosmetic differences with which manufacturers hoped to gain a marketing edge. There were extra bells and whistles you could get if you wanted and could afford to shell out for a more expensive model. From time to time somebody even came up with a technological refinement that did something a little better. But a 1960 Ford was a lot more like a 1960 Chevy than a 1930 Ford. Back in the earliest days of automotive technology, people were trying out all kinds of wildly improbable contraptions. Most of them got winnowed out by Darwinian evolution, and the survivors were the ancestors of the things we drive today. But the ones that got winnowed must have been fun to watch and to tinker with, while they lasted.

There were, of course, trade-offs. The early representatives of a new technology offered personality and excitement; their sedate descendants offered reliability. For a born tinkerer, one of the first cars must have been one of the best toys imaginable—but if its avowed purpose was to be a tool for transportation, it wasn't a very good one. Early cars were smoky and noisy and broke down a lot. When they did break down, you'd better be able to fix them yourself—which might include machining parts from raw metal—because when they were new and there weren't many of them, there weren't many people who knew how to repair any particular model, or many places to buy ready-made parts. There weren't many roads for them to drive on, and few of those were good ones. And they were still competing with old technologies that saw them as hostile and unwelcome intruders. It's a good thing the early cars were easy to work on; I'm told that some places had—and enforced!—laws requiring drivers to disassemble their cars if they frightened horses.

Now, of course, the automotive scene is very different. Cars are everywhere. Almost every adult in this part of the world can drive, and most either own or have regular access to at least one. There are relatively few kinds, all relatively similar, and lots of individuals of each. They can all use the same roads, and there are good paved ones going almost everywhere. Anybody who can drive one car can drive any other with only trivial adjustments to get familiar with a slightly different control configuration and handling feel. Modern cars don't break down anywhere near as often as they used to, and when they do,

Analog Science Fiction and Fact (Astounding), Vol. CXXIII, No. 5, May 2003. USPS 488-910, ISSN 1059-2113, GST# 123054108. Published monthly except for a combined July/August double issue by Dell Magazines, a division of Crosstown Publications. One-year subscription for $39.97 in the U.S.A. and possessions, in all other countries, $47.97 (GST included in Canada) payable in advance in U.S. funds. First copy of new subscription will be mailed within eight weeks of receipt of order. When reporting change of address allow 6 to 8 weeks and give new address as well as the old address as it appears on the last label. Periodical postage paid at Norwalk, CT and additional mailing offices. Canadian postage paid at Montreal, Quebec. Canada Post International Publications Mail, Product Sales Agreement No. 260622. © 2003 by Dell Magazines, a division of Crosstown Publications, all rights reserved. Protection secured under the Universal Copyright Convention. Reproduction or use of editorial or pictorial content in any manner without express permission is prohibited. All stories in this magazine are fiction. No actual persons are designated by name or character. Any similarity is coincidental. All submissions must be accompanied by stamped self-addressed envelope, the publisher assumes no responsibility for unsolicited manuscripts or artwork.

POSTMASTER: Send change of address to: ANALOG SCIENCE FICTION AND FACT
P.O. Box 54625, Boulder, CO 80328-4625.

IN CANADA RETURN TO: Transcontinental Sub Dept, 525 Louis Pasteur, Boucherville, Quebec, J48 8E7
Executive Office: Penny Press, 6 Prowitt St., Norwalk, CT 06855
Editorial and Advertising: Analog Science Fiction and Fact, 475 Park Avenue South, New York, N.Y. 10016
Subscriptions: Analog Science Fiction and Fact, P.O. Box 54027, Boulder, CO 80322-4027

Printed in Canada

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

it's an inconvenience but seldom much more. In any city, you're near somebody who knows how to fix it and has quick access to the right parts and tools. Even in the remotest rural areas, you can call somebody to tow you to a properly equipped shop.

A mature technology, in other words, is relatively invisible. It's become something you count on to do a job, and you don't think much about it *per se* except on the relatively rare occasions when it malfunctions. An infant technology, on the other hand, attracts (and demands) lots of attention, both because of its newness and because of its crankiness. As it grows and develops, both novelty and quirks wear off and it fades gradually into the taken-for-granted background. The difference between living and working with new and mature technologies is, in science-fictional terms, something like the difference between colonizing a new world and living on one that has been successfully colonized for a long time.

Each has different kinds of appeal. Now that cars, planes, radio, and recordings are well established and refined, I like being able to count on them as routine parts of everyday life. Still, I've sometimes thought wistfully that it would have been fun to be around in the heady days when they were brand new and people were trying all kinds of variations on a theme nobody had ever heard before. . . .

And then I realized that I *was* in on the ground floor of at least one such revolution, with all the advantages and disadvantages that implies. We are living in the frontier days of computers and the internet. Already they have radically transformed many aspects of how people live and work, and we can only dimly imagine how far, and in what directions, that transformation might eventually go. Our past attempts at prediction, even by people known for their vision and imagination, have often fallen far short of reality. A fact article by Leo Vernon in the July 1939 issue of this magazine (then called *Astounding Science Fiction*) tried to visualize the kind of computer that might be possible in the future. "Men are working and planning," he wrote, "for a new and greater punched-card machine. . . . The dream machine may fill an entire building. It will be operated from a central control room made up entirely of switchboard panels, operated by trained mathemati-

STANLEY SCHMIDT .....Editor
SHEILA WILLIAMS .....Executive Editor
TREVOR QUACHRI.....Associate Editor
BRIAN BIENIOWSKI.....Assistant Editor
MARY GRANT .....Editorial Assistant
VICTORIA GREEN .....Senior Art Director
JUNE LEVINE.....*Associate Art Director*
CAROLE DIXON.....Senior Production Manager
ABIGAIL BROWNING.....Manager, Subsidiary Rights and Marketing
SCOTT LAIS.....Contracts and Permissions
JULIA McEVOY .....Manager, Advertising Sales
CONNIE GOON .....Advertising Sales Coordinator
BRUCE W. SHERBOW.....VP, Sales and Marketing
SANDY MARLOWE .....Circulation Services

PETER KANTER
Publisher

CHRISTINE BEGLEY
Associate Publisher

SUSAN KENDRIOSKI
Executive Director,
Art & Production

Published since 1930

First issue of Astounding
January 1930 ©

ADVERTISING REPRESENTATIVE David Geller Publishers' Rep. (212) 455-0100
EDITORIAL CORRESPONDENCE ONLY analog@dellmagazines.com

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

cians, and an automatic printer giving back the results."

Vernon could hardly have imagined that by the turn of the century his building would have been filled with offices in which every individual scientist had a little box on his desk that could do far more than the building-sized machine Vernon described. And not just the scientists—every secretary and bookkeeper, too! In a similar vein, the July 1971 *Analog* included a science fact article about Spacewar, perhaps the first video game, invented at MIT. In his blurb for the article, editor John W. Campbell wrote, "It's a great game . . . but I'm afraid it will never be widely popular. The playing 'board' costs about a quarter of a megabuck!" Just a few years later my very young nephew received, as one of several Christmas presents, a far more sophisticated video game. The equipment was a tiny gadget costing on the order of a hundred dollars, to be used with the sort of television set found in almost any living room in the country.

So we've been moving fast. The state of computers, and their penetration and reshaping of the structure of society, has come much farther than even skilled prognosticators anticipated just a few years in advance. I have no reason to suppose our present attempts to foresee the future will prove any less shortsighted.

On the other hand, while we are doing things that people couldn't do at all until recently, like e-mail and CAT scans and a worldwide hypertext library and free-for-all, present computer systems still have a good deal of the quirkiness and crankiness of the early automotive age. It's no longer quite as bad as the situation that inspired Christopher Anvil's story "Bugs" (*Analog*, June 1986), in which cars had developed like computers: Not only did different manufacturers make cars with noninterchangeable parts, but each needed its own kind of road, special ports for loading and unloading cargo, etc., and it was considered a radical marketing innovation for the engine to be included in the vehicle price. But we still have people so intoxicated with the sheer novelty of e-mail that they flood one another with vast quantities of it that nobody would consider worth writing or reading if it weren't so unprecedentedly easy. And we still have servers failing so often that e-mail can still hardly be considered a very *reliable* means of communication, and everybody takes that for granted and jokes about it.

One reviewer, commenting on my novel *Argonaut* (Tor, 2002), mentioned that humor was what I evidently had in mind when I had a character profoundly shocked by her computer's crashing when she tried to send e-mail, because that just didn't happen. Well, yes, on one level I did think of it as a bit of a joke, because the notion that crashes "just don't happen" is so utterly different from anybody's experience to date. I imagined when I wrote it that some readers might consider the idea of computers being that reliable the most outlandish "prediction" in the book. Yet on another level, it was a perfectly serious speculation, and I can easily imagine that in thirty years, when the story takes place, computers and the internet will be so reliable that a user *can* reasonably assume that something is radically wrong when they fail. That has, after all, happened with other technologies in our lifetimes. When I was growing up, for example, it was quite common for a television show to be interrupted suddenly by a test pattern and words like TECHNICAL DIFFICULTIES—PLEASE STAND BY. Now it's so rare that many younger viewers have never seen it. Whether computer technology shows a similar improvement depends on whether it outgrows the incessant striving after Bigger and Faster and starts putting comparable effort toward More Reliable.

We've already made some progress in

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

that direction. The computers I use now are already far less cranky than the ones I used in graduate school, even though they're also doing far more things. They're also more compatible with each other. Even though Macs and PCs still use different operating systems, and a few others still exist in even smaller numbers, the user interfaces now look and feel quite similar. And most recent computers are equipped with translators that can easily convert one file format to any of several others. We've come a long way toward having one road system on which everybody can drive, and the remaining potholes are gradually getting patched. Where will those roads eventually lead, and what kind of information landscape will surround them? Our best efforts to imagine may be no more successful than the Wright brothers would have been in imagining routine transoceanic flights, SSTs, the role of airplanes in the World Trade Center massacre, and the security measures now in effect at airports.

And what utterly new things might today's kids get in on the ground floor of? Nanotechnology and biotechnology look like leading candidates. We can still hope that space will get back on track and eventually get to where it should have been now, and then beyond. But the most interesting of all may turn out to be things that not even the science fiction writers have thought of yet. ■

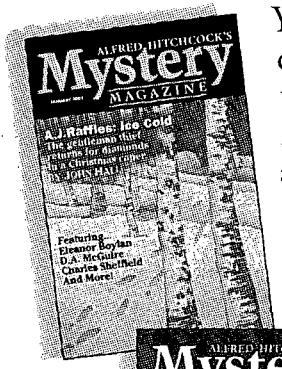
We welcome your letters, which should be sent to Analog, 475 Park Avenue South, New York, NY 10016, or e-mail to **analog@dellmagazines.com**. Space and time make it impossible to print or answer all letters, but please include your mailing address even if you use e-mail. If you don't want your address printed, put it only in the heading of your letter; if you do want it printed, please put your address under your signature. We reserve the right to shorten and copy-edit letters. The e-mail address is for editorial correspondence *only*—please direct all subscription inquiries to:
P. O. Box 54027, Boulder, CO 80322-4033.

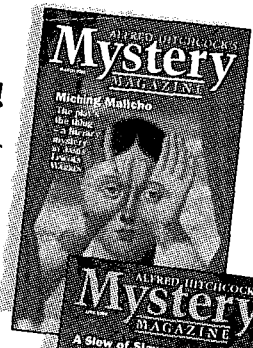
LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

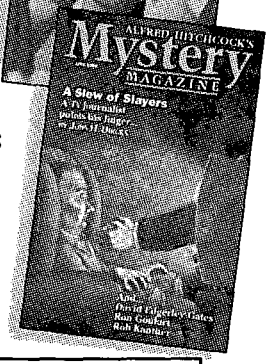
MYSTERY VALUE PACK

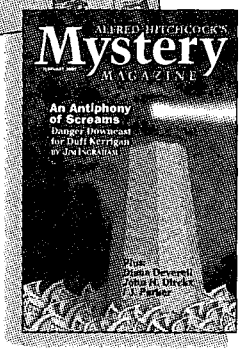
4 magazines for just $5.95!

Give yourself **chills** with our value pack of 4 best-loved issues of **Alfred Hitchcock's Mystery Magazine!**









You'll enjoy dozens of captivating tales from world-renowned masters of suspense and talented new writers alike — all for just $5.95 plus shipping.

You save 50% off the regular price.

It's easy to order. Just fill out the coupon below and mail it to us with your payment. **Your satisfaction is fully guaranteed!**

PENNY MARKETING

Dept. SM-100, 6 Prowitt Street, Norwalk, CT 06855-1220

YES! Please send me my **Alfred Hitchcock's Mystery Magazine Value Pack.** I get 4 entertaining issues for just $5.95 plus $2 shipping and handling ($7.95 per pack, U.S. funds). My satisfaction is fully guaranteed! My payment of $_____ is enclosed.(AHPK04)

Name: _____
(Please print)

Address: _____

City: _____

State: _____ **ZIP:** _____

Please make checks payable to Penny Marketing. Allow 8 weeks for delivery. Magazines are back issues shipped together in one package. To keep prices low we cannot make custom orders. Add $4 additional postage for delivery outside the U.S.A. Offer expires 6/30/04. 53C-NQHVL2

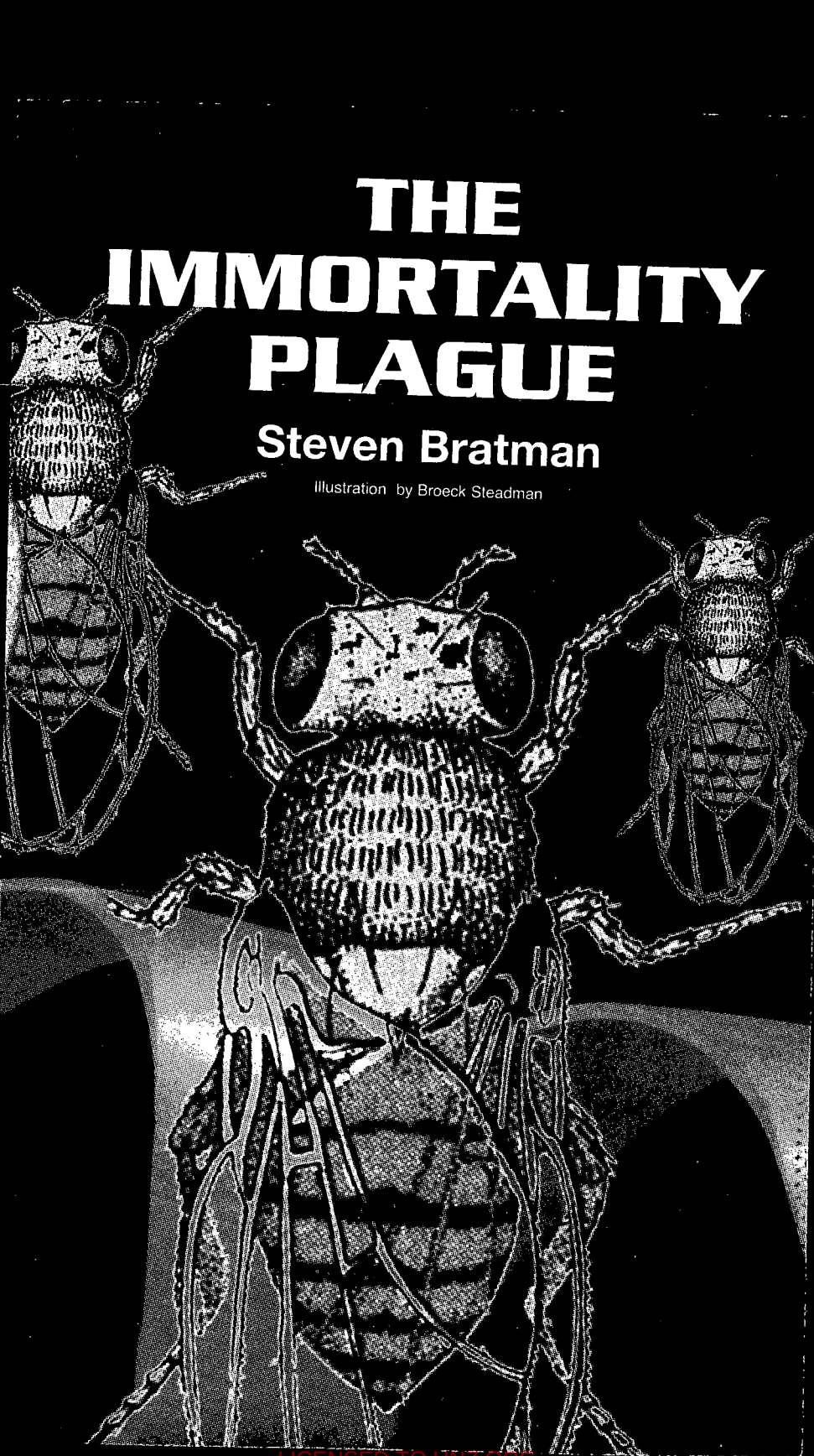
LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

THE IMMORTALITY PLAGUE

Steven Bratman

Illustration by Broeck Steadman



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

I opened the door to my office, and froze, appalled to see rows of numbers scrolling down my computer screen. Unable to take my eyes off the sight, I reached out blindly with my left hand and dropped my raincoat in the general vicinity of a hook on the wall. I vaguely heard it slosh to the ground as I sidled into the ergonomic chair beside the computer. The menu bar at the top read "Mustela Putoris Furo: Common Ferret."

Why the hell was my computer displaying our lab's proprietary ferret genome data? We kept this kind of information under top security. If one of my graduate students had left the database open, he'd catch holy hell.

I clicked the mouse to close the window. Nothing happened. Instead, a small chatroom-style box appeared at the bottom of the screen.

"Oh, hi Professor Evans," it read. "I'm stealing your data. Don't bother turning off your computer. If you do, I'll just access the University system through your home computer. You should have used a longer password. One with numbers and symbols. But no-o. You didn't. No one ever does. It's wa-ay too much work."

Hacked. I'd been hacked. I was being hacked right now. What should I do?

It would take me more than an hour to drive home. And no one within a two-hour drive had my house key.

The ferret genome screen closed and rows of Holstein genome data filled the screen. More words appeared in the box.

"So chill out, pour yourself some coffee, and we'll chat a bit."

I picked up the phone to call UCLA's computer security department, then slammed it down. Why bother? They never answered when I called. They'd phone back in three days if they felt like it.

Damn it, this guy must be from some rival university. Cornell? MIT? With this information, he could piggyback on our research and leap ahead by years. I had to stop him.

The FBI. That's who I should call, no matter how much the idea repelled me. They'd been bragging all over the place about their hot cybercrime division.

I reached out toward my computer to use the online phone directory, and then remembered I didn't have control of the computer. I'd have to use a damn physical phonebook. Did I even have one? I scanned my office and didn't see it.

The Holstein data disappeared and a squirrel genome replaced it.

Compose yourself, Charlie. Think. What should you do?

Draw him out. Maybe he'll tell you something revealing, something the FBI can use to catch him.

I centered the cursor on the reply box. "You're right," I typed. "No point shutting you out of this computer while my home computer's turned on. I'm curious, though. What do you want with all those genomes?"

A small head appeared in the box, a cartoon-like avatar of a clean-shaven young man with a long blond ponytail. A blue rectangle reading "Brian" floated above his head. A second avatar representing myself appeared nearby.

I smiled at the flattering representation: salt and pepper hair, a neatly trimmed black beard, and a nose decidedly smaller and smoother than my own pitted proboscis. I'd shaved the beard when I reached fifty-five, preferring to look younger rather than wiser, and my hair had lost all its pepper in the eight years since.

A blue balloon popped open beside Brian's mouth, and words scrolled through it. The font resembled a child's block printing, with every third "S" reversed. "I collect genomes for my own research, Charlie. I sift for commonalities and differences. And—please don't drool all over your keyboard—I have a working phenotypic model. So I can do a lot more with the data than you can."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"No." I didn't believe it. "A phenotypic model? The Holy Grail of molecular biology? Nobody has one."

Brian's avatar shrugged, the little symbolic shoulders rising past his ears. "If you say so. All I know is that I plug hypothetical genetic alterations into this funny little program I wrote. A couple minutes later, it spits back detailed descriptions of changes in structure and function. Maybe if you're nice I'll let you use it some time."

I *did* want to drool. With a working phenotypic model, genetic therapy research could go ahead ten times faster. Unfortunately, we were years—or decades—away from having one.

There were so many obstacles. Just coaxing mathematicians and biologists to work together was enough to make you lose your lunch. Then you had to carry out hundreds or thousands of experiments in genetic modification to check out your model's predictions. Not easy, considering that the FDA had banned retrovirus therapy until last year. To make matters worse, no individual laboratory had access to the full body of existing data. Every university kept its genome data proprietary, like we did.

Of course, if you didn't mind breaking into secure records to steal proprietary data, you could get around that last problem.

I felt my mouth fill with saliva, and swallowed. "Are you connected to a commercial company, Brian?"

His avatar grimaced. "Definitely not. I hate industry. Used to work in a university lab, though. Made it most of the way to a PhD in molecular biology. In my spare time, I took graduate courses in math and computer science. That's proved quite helpful. I run my phenotypic model on other people's computers running in parallel, and they don't even know it's happening. Have you ever seen your computer's hard drive light come on at night? Might be me."

So this guy combined all the necessary skills in himself, along with a willingness to break the law. Someone brazen enough to do that might even have worked straight through the FDA's ban. Maybe he really did have a phenotypic model. God, I wished I could put my hands on it.

"But why do you do all this? Why risk getting caught? Do you expect to make a lot of money?"

"I don't care about money. I live on a small trust. Would you believe I do it for the love of science?"

I wished I could believe him. Unfortunately, I'd grown too cynical over the years. No one did science for the pure love of it anymore; Einstein was probably the end of that line.

"That's a laudable motivation. Quite unique." I jumped out of the seat and rummaged around my office for the phone book. No luck . . . Yes. There it was, on top of a bookshelf. I yanked it down and hurried back to the computer.

"I'm unique in a million ways, Charlie. You know any other biologists that can hack?"

I flipped through the blue government pages. "It *is* an unusual combination of skills."

"It shouldn't be. DNA is the one truly digital portion of the body. DNA manipulation is really a form of hacking."

That thought genuinely intrigued me. "You have a point. I've never considered the connection before."

City of Los Angeles. County of Los Angeles. State of California. Where were the damn Federal government listings?

"With all that education, you must be a lot older than the average hacker."

"I'm thirty-two. And a lot smarter than the average hacker, too."

The computer stopped displaying animal genomes and switched to retroviruses: our major tool for altering DNA. Or hacking into DNA, to use Brian's description.

If I'd been ready to drool before, now I wanted to run away in embarrassment. I recognized the particular retrovirus on

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the screen only too well: my big, my colossal mistake.

Before the FDA halted experimentation in 2005, we'd learned a great deal about using retroviruses for gene therapy. We'd been poised to eradicate every disease caused by simple genetic errors: familial high cholesterol, diabetes, cystic fibrosis, Parkinson's disease, and Alzheimer's disease, to name the most prominent. Then came the near-disaster—my disaster.

In the interest of safety, therapeutic retroviruses are designed not to jump from one person to another. Back then, we had no idea how easily a non-infectious virus can turn infectious. Half a dozen genes will do it.

We learned that during flu season, 2005. Everyone in the lab was shedding influenza virus. A particular retrovirus uncoiled in a contaminated solution, picked up a few key genes from influenza, and made the jump into one of our students. Only luck, and a rapid quarantine, prevented a worldwide DNA-altering plague.

That particular retrovirus wouldn't have done any harm, at least at first. It exchanged the genes predisposing toward Alzheimer's disease for healthier genes. Benign enough. Some pundits actually argued *against* trying to stop it. However, they were wrong. If the virus had gone wild, its helpful DNA-altering actions might very well have spontaneously mutated. The result could have been unpredictable damage to the genetics of humanity.

The FDA instantly shut down all genetic therapy labs in the US, and every other country followed suit. We couldn't carry out any work at all for eight years. Just fifteen months ago, a consortium of universities perfected the Histone Locktight technique to block spontaneous changes in therapeutic retroviruses, and research began again.

I'd redeemed myself to a significant extent by playing a major role in that accomplishment. And the impressive retrovirus research I'd published since had rehabilitated me further. But I still had a long way to go. That's why I couldn't let this guy steal our data. I needed to keep on publishing exemplary, cutting-edge work. And with our data, Brian could very well end up publishing it ahead of me.

I ran my finger down the Federal listings. There it was: Federal Bureau of Investigation. I picked up the phone and hesitated, remembering my last encounter with the FBI. I hated the thought of inviting the Bureau back into my life. What choice did I have, though?

Better type something. "What's the weather like out where you are, Brian?"

The avatar shook a warning finger at me. "Not nice, Evans. You're probing for clues to catch me. Hey, when you contact the FBI, tell them this: if they dog me too close, I'll bite. Signing off."

The avatar spun around, shrunk, and disappeared.

I waded through the FBI's voicemail labyrinth and ultimately reached the box of a certain Dan McClury. He returned my call later that afternoon. The following morning, our department administrator, Lisa, called me on my back line to tell me he'd arrived.

I password-protected my computer and walked out into the bustling molecular biology laboratory outside my door. I aimed a cheerful wave in the general direction of my post-docs and graduate students, hard at work among the black lab benches, stainless steel DNA sequencers and yellow-and-black biohazard units. Many of them waved back.

They were a great group. I'm not the world's most creative scientist. I accept that. Still, I know how to get things done, and I know how to work with talented people. My kids worked hard for me, and I worked hard for them; if I ever won the Nobel Prize, they'd all get proper credit.

When I returned with McClury, several heads turned to study him with more

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

than academic curiosity. The special agent was an annoyingly good-looking man in his mid-forties, tall, well-muscled, with dark hair and a neat moustache. Lisa had made no attempt to conceal her ogling glances when I retrieved him from her office. My female graduate students and post-docs behaved more discretely, but a quick poll later that day rated him in the top one percent of male beauty. Movie star quality. Only my gay post-doc disagreed; he put McClury in the top 0.1 percent.

I tried to hide my jealousy, even from myself. Someone in my position in life shouldn't care about physical appearances. Yet I did, and I always had. Throughout my life, personal vanity had triggered periodic efforts to get in shape. I'd achieved my greatest success in that regard at age thirty-five, using a gym almost daily, and posing before a mirror each night to admire my biceps and calves.

I never managed to keep it up for long, though; scientific ambition always called me back to what really mattered. And now I'd grown too old. Oh, according to my implanted medical chips, I was still healthy enough. But I looked old. Fragile and sagging skin hung loosely on my forearms, and drooped in v-shaped folds beneath my neck. My upper arms resembled toilet paper tubes, and my feet splayed out when I took off my Jobst stockings at night. I hated growing old, and at the same time judged myself critically for caring as much about it as I did.

Even leaving aside his dashing appearance, I felt predisposed to dislike McClury simply for *being* an FBI agent. I'd met many members of the Bureau during the period after my retrovirus disaster. I couldn't object to their goal—securing the infectious retrovirus against possible terrorist appropriation. However, I could have done without the arrogance and disrespect. Clearly enjoying the prerogatives of their position, they intimidated my secretaries, humiliated my students, and took obnoxious liberties with everyone's private possessions. They confiscated my hard drives and Rolodex and, for no particular reason, refused to let me copy down any crucial numbers. I'd lost both the phone number and email address of one of my old friends. I'd had to wait for him to contact me, and that didn't happen for six months.

Yet, to my pleasure and surprise, McClury didn't fit that mold. He shook my hand warmly, showed respect in every gesture and facial expression, and generally indicated that he considered me a person of distinction and significance in the world. He even made an intelligent comment on our lab's recent publication in *Nature*. I realized he'd done considerable homework in the short time since I'd contacted him, solely for the purpose of putting me at ease. This agent was a decent fellow.

"Is this the hacked machine, Professor Evans?"

When I nodded, he sat in the seat beside the computer, facing away from the screen. He studied my small office with apparent interest. His eye lit on a colorful metal sculpture on my desk: a DNA double helix wrapped around small spools.

"That's a model of a nucleosome." I picked up the artifact and carried it over to him. "DNA plus these spool-like structures called histones. Histones control whether a certain gene expresses itself or not. In some ways, they play as important a role as DNA itself."

He turned it over in his large hands. "Nicely constructed. A work of art. I collect things like this—objects that serve a practical purpose and at the same time are decorative." He ran his fingers along the brushed steel base and handed it back. "Down to business. Cybercrime is a growth industry, unfortunately. I manage a team of top-notch security experts, and I can tell you we have our hands full."

"Are many of them ex-hackers?" Like

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

everyone else, I'd heard that computer security agencies hired every hacker they could find.

McClury looked annoyed. "The media love those stories. Okay, it happens sometimes. Mostly, though, your average hacker doesn't know as much as he thinks. And they're terrible employees, loners who hate authority and don't cooperate with a team. You wound their ego and they take revenge. We prefer career computer scientists, thank you very much."

I remembered listening to a similar speech given by the UCLA chief of computer security. And look how successful he'd been at protecting my data!

My confidence dipped. Personally, I'd found that true talent and untamed individualism went together. I wasn't sure a group of bureaucratic scientists could outthink someone like this Brian.

Maybe they could, though, if they put enough agents on the job. I sure hoped so. Because if they didn't catch Brian pretty fast, the damage would become irrevocable. A person with the right skills could learn an enormous amount from our data in a few months or even weeks. Even if he erased all the information after studying it, the simple knowledge of where he was going would make it much easier for him to get there.

McClury listened without interruption as I told the story. Only when I'd finished explaining everything in my own words did he start in with his own questions and comments.

The agent asked me why I thought Brian had started a conversation with me in particular. Surely the hacker would have broken into many other databases besides ours. And yet, so far as McClury knew, no other lab had reported an extended conversation with a hacker. Was our dialogue a coincidence, the result of my catching him in the act? Or did this Brian have a personal connection with me?

When I drew a blank, McClury wondered out loud whether Brian had once worked in my lab at some point. Maybe he still worked in my lab. Did any members of my group have unusual computer skills? Were any of them unstable?

I had to suppress a smile at that last question. My best students were all unstable in their own ways. None of them possessed particular expertise with computers, though, so far as I knew.

"Could it be someone outside your lab? Are there any colleagues who might bear you a grudge?"

This time I didn't hold back the smile. "Of course there are. Every director of every retrovirus lab in the country."

"I mean want to hurt you personally," he clarified. "Not just compete against you."

"As I said. Every director of every lab."

He looked surprised.

Like most people outside scientific academia, McClury apparently believed that we scientists did our work for the sheer love of knowledge. I took a bit of pleasure in deflating his idealistic fantasies. In reality, we were a bloodthirsty bunch, waging constant battle against each other for prestige, reputation, funding and the best students. It didn't help that we constantly sat in judgment on one another. When a journal needed to review a potential publication, or a funding source wanted to evaluate the scientific value of a grant application, they had to call upon the same limited community of experts. We shifted alliances constantly, and carried through subtle acts of revenge for real or imagined betrayals. Over the years, we'd built up deep reservoirs of bad blood.

McClury took this all in, and asked for names and details. I was happy to give them, because it let me hide what I was really feeling. His questions about potential enemies had aroused memories of the second great error of my career, an error I didn't want to reveal to him or anyone else. I talked on fluently, while inside I re-lived the shame and desire associated with one particular student from the past. I didn't know whether I

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

felt more relief or sadness that she'd never reentered my life.

McClury wound up his questions and turned to general advice on how to deal with Brian next time we talked. "And he'll get in touch with you again, I promise. Hackers are lonely guys. Make friends with him. You've already gotten off to a good start. Get him to brag about his other hacks, and his biology research. He'll give away critical information sooner or later."

Next, he turned to my computer. He began by carefully recording the serial numbers of everything attached to it, even the printer, keyboard and webcam. Then he made a copy of my hard drive. Finally, he loaded a batch of new software onto the machine.

"We can track his intrusions now." He gave me a reassuring smile. "Don't worry. We'll catch this guy. I promise."

McClury stood up and retrieved his brown leather coat from a hook. He threw the coat over his left shoulder, hooked the collar with his left thumb, and held out his right hand.

I felt a rush of confidence and shook his hand gratefully. "One question, though," I said, when he reached the door. "What did he mean about biting if the FBI dogged him too closely?"

McClury paused with one hand on the knob. "I'd call it a bluff. When he realizes the FBI's after him, he'll tuck his head in his shell and not come out till Christmas."

That prediction did not prove accurate. A week later, McClury walked into my office, his gait slightly stiff and his facial expression more rigid than normal. He shut the door a bit too loudly and once again took the seat by my computer.

"This kid seems to crave attention," he said. "Well he'll get it now. Twenty agents worth of attention."

Twenty agents. Oh, good. Now they'd catch him for sure. "I take it he wasn't bluffing?"

"Not exactly. You'll hear about it on tonight's news. Our friend ripped through the FBI's computer security barriers and destroyed about a third of all our records. Case files, undercover agents, evidence inventories. Could have crippled us. However, he kindly made a backup copy of all the information and posted it as a file with an obscene name."

I suppressed a desire to smile. Over my years of working with brilliant young people, I'd absorbed a certain sympathy for the desire to thumb one's nose at authority. "You had your own backup copies, I'm sure."

"Yes—and he'd corrupted the last three day's worth, nationwide. Hacked into the backup system so it recorded junk. He's a good hacker, I'll grant him that. Wouldn't want to fight him on that turf. We won't have to, though. There's such a thing as police work, something hackers don't know a thing about. This kid's hung himself."

Unexpectedly, I felt a flash of sympathy for Brian. "When you catch him . . ." Looking at McClury's face, I had no doubt he'd catch the hacker. "Will he get any credit for not actually destroying your data?"

McClury flashed a cold smile. "He probably won't get shot during the arrest."

"McClury," a voice said, "you're an ass."

The agent jumped up, a gun in his hands. He pointed it at the door, and then at my closet. I felt a cold chill.

"Brian?" I asked.

"In person."

We both looked toward the speakers on my computer, clearly the source of the voice. McClury put away his gun, rose from his chair, and ran his fingers along the opposite wall. "He must be listening in through a bug in the wall."

"Wrong," Brian's voice said. "That's the sort of thing people like you do. I'm only a simple-minded, helpless hacker. I listened through the microphone on Dr.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Evans's computer."

Clever, I thought, and obvious.

"Listen, McClury," he said. "I don't want to harm the FBI. That was just a demonstration of what I *could* do. The point is, please back off and leave me alone."

I nodded thoughtfully, recognizing the patterns of Brian's psychology. I'd worked with dozens of people like him. Many of my best students were much the same: bull-headed geniuses accustomed to getting their own way. I'd developed a whole bag of tricks for getting them to behave. And this kid needed the benefit of my experience: trying to bully the FBI was plain idiotic.

"Brian," I said. "Take a step back and think. You've hacked into the FBI's computer system. Are they going to let that go unpunished? Not likely. And the further you go, the worse it's going to get. Threatening them isn't going to work. Remember, they can throw unlimited resources at you. You've got to surrender now."

I meant what I said. Of course, if he turned himself in, it would also solve my problem.

"Listen to the professor," McClury said. "He's right."

"Go away, McClury. I won't talk to you."

"Keep in mind that I'm not promising any amnesty if you turn yourself in," McClury continued. "Only that you'll get out of jail a lot quicker that way."

Brian's avatar appeared on the screen, its arms folded, its face sullen. No words appeared.

McClury briefly glared at the computer. "Fine with me." He stood up, threw his coat over his shoulder, and stalked out.

I took the chair he'd vacated and spoke into the microphone. "I'm serious. They won't quit till they get you. You know the theory of holes? When you're in a hole, the first thing to do is stop digging yourself deeper."

"Let's type instead of talk," Brian's figure said. My avatar appeared on the screen beside his. "I'm sure *he's* got your office bugged. I bet he's sitting in some carpet cleaning van across the street listening in, and using that stupid keystroke recording spy program he put on your computer. I've hacked into it, by the way. He'll read what I want him to read."

"Typing's fine," I typed.

As always, his words poured out quickly, without spelling mistakes or lower-case words. "Thanks for reminding me of the theory of holes. Only I can't turn myself in. I'm a biologist, Charlie. That's my real love. I have this great lab; I'm making real scientific advances. They'd never let me keep on working the way I have to. I'd get hemmed in with a zillion bureaucratic rules. They might even force me to become a professional computer security expert as part of a plea bargain. I'd hate that. Hacking is just a means to an end for me."

I couldn't help warming to that. "So why didn't you stay in school?"

"A certain professor shafted me. Stole my work on histones and used it to develop the technique that became Locktight. Bastard didn't give me a bit of credit in his publication."

My heart thudded. I pushed away from the computer. When Brian's avatar grew long brown hair and turned female, a shiver ran down my spine.

Brianna Carleton. My own graduate student. I'd done exactly what she said. Two years after the ban, I'd published a seminal article on histone control of DNA, and failed to credit her work. It had been the most unforgivable act of my career, the first and only time I'd let naked personal ambition completely override my ethical principles.

I typed my reply in a rush. "God, I'm glad you contacted me, Brianna. I've never regretted anything like I regret what happened that time. All these years I've wanted to apologize, to make it up to you. Only you disappeared."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Her avatar tapped its finger on her lips. "You could have published an acknowledgment and an apology. I've been waiting."

Direct hit.

"Look at it from my point of view, Brianna. I barely survived my mistake with the retrovirus. If I admitted stealing your work, I'd have to give up on biology completely. You can understand why I can't risk that. Look, why don't you come back to the lab? I'll give you proper credit from now on, get grants for you, and push your career ahead. We always worked well together."

"*You and I* always worked great together. If you only could have dumped those idiots you had for students . . . But anyway, you're not making sense. Have you already forgotten that McClury plans to send me to jail? I've got a better idea. You come join me."

My mind raced. Apparently, she'd set up her own lab somewhere. Which meant she'd shipped equipment to herself. If I told McClury, maybe he could use his vaunted police work skills to track that down. Or I could pretend to accept her offer and lead the FBI straight to her.

Except I didn't want Brianna arrested any more. I owed her. I owed her big time.

Everything made sense now. Brianna had been my most talented student, ever. She was just as skillful in the lab as she was brilliant in the idea department. And she seemed to know in advance exactly what lines of investigation would yield results. I learned to trust her instincts, even when what she proposed sounded impossible.

Like that synthetic DNA project. When I drove her away with my intellectual theft, she'd been developing an alternative form of DNA, built not on nucleic acids but on an entirely artificial series of chemicals, much easier to manipulate in the lab. Who knows where she would have gone with it by now. Artificial life? No one had taken up the project after she left; without her, we hadn't a clue which way to proceed.

Unfortunately, Brianna had also set the benchmark for alienating fellow students. She shot herself in the foot on all possible social occasions, and dug herself into holes so deep they touched magma. Despite all my diplomatic skills, by the end of her first year in my lab, not a single member of my group would so much as loan Brianna a bottle of hydrochloric acid. I almost had to choose between her and everyone else. Instead, I'd honed the diplomatic skills that had served me ever since. I'd never gotten her to really belong to the team, but at least she'd stopped actively sabotaging herself and everyone else.

"I don't think I could just walk away from my lab," I said. Though the idea did tempt me. "If you'd only asked straight out, I'd have given you all those genomes to make up for what I'd done to you. God, Brianna, I'm so sorry."

Her avatar gave me a charming smile. "Would you really have done that? Probably not. It's a sweet thought, though."

While she typed those words, her avatar transformed. The standard cartoony drawing grew new levels of detail and became a photo-realistic moving video image. You could see subtle nuances of expression and feeling, changing in real time.

Later, I realized she must have been using her computer's webcam to photograph her actual face. She'd altered the appearance to some extent; the avatar looked a bit stylized. Nonetheless, I easily recognized her, and that recognition disturbed me.

Brianna's ironic smile hadn't changed a bit. Nor had those thin eyebrows, that way she tossed her head, that habit of stroking her fingers along her left cheekbone.

I wouldn't exactly call her beautiful; intense was the best word. I've never slept with any of my students—I was never unfaithful to my wife with anyone—yet Brianna had tempted me al-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

most beyond endurance. Her face still shone with the same combination of ferocious intelligence and life force that I'd found almost irresistible nearly a decade earlier. Mere physical attraction seldom aroused much sexual desire in me; the passionate intensity burning in Brianna's face was another story.

The same kind of inner fire had attracted me to my wife. Deborah had been an Olympic runner in her twenties, and won a bronze medal in the 100 meter. When I married her, she no longer competed in athletics. Nonetheless, she retained her inner drive, that magical, almost spiritual focus I found so exciting.

Some men want female companionship for comfort. I've always craved something different. Deborah's presence had lofted me into a realm of life where nothing is mundane. The whole house had glowed with her atmosphere. And Brianna radiated even more of the same. I'd never met anyone as *vivid* as that woman. When she walked around my lab, I could have sworn some theatre arts student was shining a spotlight on her. She made everyone else look dim and washed out.

I hadn't gone on a single serious date since Deborah died in a car accident five years ago. No one else had tempted me. Yet now I fantasized taking up Brianna's offer for real, and becoming her lover as well as her colleague.

I pushed aside these thoughts and admonished myself to quit being a ridiculous old man. I had more than three decades on her. No way she'd find at old fart like me attractive.

I don't know how much time passed while I thought all this. When I looked at the screen again, I saw she'd typed a whole paragraph.

"It would be really great if I could come back to your lab, Charlie. You knew how to handle me, and in a nice way. You gave me great scientific advice, helped me form my thoughts. I felt like I had a real partner when I worked with you."

Her avatar gave a sigh.

"It's too late, though. I stole your data, and you naturally called the FBI, and one thing led to another. The only thing I can do now is keep them off my back with a bigger threat.

"So tell McClury this: if he keeps after me, I'll strike with something a hell of a lot worse than a computer hack. A biological hack."

"Brianna," I typed, desperate to change her mind. "You can't fight the FBI this way."

"Speak of the devil—the FBI's probing for my computer. I better defend myself. Here, I'll leave you with a puzzle."

Her avatar dissolved into a file labeled "Weapons Grade Retrovirus."

"Brianna? Are you there?" I typed.

No reply.

Infuriated, I couldn't think of anything better to do than click on the file. Before it opened, the phone rang. It was McClury.

"Tell me what you know about this Brianna Carlton," he said.

How'd he know?

"Ordinary surveillance, Charlie," he said, reading my mind. "I put a camera in your wall. And I've already run across her name and photo several times in the course of our routine interviews."

I panicked. How much had he seen? I'd just admitted my intellectual theft in the Locktight affair. I couldn't afford to have that story get out.

"So you were able to read the whole dialogue?" I kept my voice blasé.

"No. Unfortunately, you pushed your chair to the side and blocked the camera."

"What about the keystroke recorder?" I asked, deeply relieved.

"Transmitted the complete speeches of Abraham Lincoln. "

Thank God.

I gave him an edited version of our conversation, consistent with the cover story I'd used for years. Brianna had been too arrogant for her own good, un-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

able to work with other students, and quick to take personal credit for every one of our lab's accomplishments. When I'd accidentally left her name off an important paper, she'd exploded in fury, stomped off, and never come back.

It was close enough to the truth to satisfy. And if any of my former students had ever suspected how much of the Locktight work had really been Brianna's, they'd long ago unconsciously altered their memories to match their feelings. Brianna had committed many real acts of outrageous arrogance; if her claims had been justified in this particular case, no one wanted see it that way.

I kept something else secret from McClury as well: my long smoldering sexual attraction for the woman. He didn't need to know a thing about that.

"So what should I do now?" I asked.

"No change in plan. Keep up close communication and act as friendly as possible. With any luck she has something of a crush on her old professor. Get her to talk as much as you can. I'll check in with you daily."

When McClury hung up, I opened the file and stared at the genome of her "weapons grade" retrovirus. Of course, there's no way to identify something like that on sight; a genome is a list of raw data. I performed a quick search of our computer databases and identified the retrovirus as one we'd used in experiments on the common housefly.

How could she use a housefly as a weapon? To find out, I had to analyze the payload of this retrovirus. The "payload" is what we call the genes that a therapeutic retrovirus inserts into its target.

After an hour of database searching, I found a partial match in the gene sequence of bees and wasps. Venom? Did she plan to create venomous houseflies.

By design, therapeutic retroviruses can't spread on their own. The Locktight safety protocol ensures that. So she'd have to infect flies individually. It would take forever. And even if she did that, flies can't sting.

I looked closer, and discovered that she'd weakened the Locktight protections. The virus on the screen could spread on its own from one fly to another.

And I knew it would spread quickly. Monsanto had once designed an infectious virus to decimate the world's fly populations. While they had never received permission to use it, they'd carried out extensive modeling of the likely outcome. Epidemics proceed at an exponential rate, especially when the host has few natural or artificial barriers to its movements. And what can stop a housefly? Monsanto's projections indicated that one season would suffice to spread the virus throughout most of the world.

Then I remembered something else relevant. Certain ancestors of the modern common housefly possessed a venomous bite. Brianna might have found a way to reactivate that potential. It's always easier to restore a previously existing genetic ability than to create a new one from scratch, and, with her phenotypic model, it wouldn't be too hard.

God, what an idea. A plague of poisonous biting houseflies. Something worthy of the Old Testament.

Houseflies thrive on every continent, penetrate almost every structure, and cohabit intimately with humans. If she released this plague, life all over the planet would become substantially more miserable.

How like my Brianna to think this was a good idea. The brilliant, prideful, blind idiot!

I wanted to cry and I wanted to scream. I wanted to throttle her. If only the stupid woman would get back in touch with me! I had to talk her out of this brainless plan.

A week later, I still hadn't heard a word. It was ten at night, and I was at home researching Kurniawan Setyabudi, the Indonesian investor who controlled

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

one of my major corporate sponsors.

The Setyabudi Group supported my lab to the tune of fifteen million dollars, yet I'd never communicated with him directly. Today, he'd sent me an email with a series of intriguing and intelligent questions about the potentials of genetic therapy. I knew it behooved me to learn what I could about him before I responded. Decades of experience in begging for money had taught me the importance of researching one's potential benefactors.

From what I could gather, the billionaire investor lived a life of obsessive obscurity. He reportedly possessed a Howard Hughes-like phobia about catching diseases, and took precautions that bordered on insanity. If true, that suggested several promising lines of approach. Setyabudi would probably respond favorably to any research that could enhance immunity. I filed that thought away and looked further.

An hour later, I hadn't found a single new fact; just a pile of ridiculous stories. According to at least five dozen websites, Setyabudi belonged to the group of Seven Evil Men who ruled the world. His picked men and women penetrated deep into governments, corporations and world religions, and secretly manipulated human history. I waded through reams of this kind of garbage; paranoid conspiracy theorists irritated me beyond measure, and my wasted sojourn into their world put me in a sour mood.

That mood sweetened considerably when Brianna's avatar emerged onto my computer and grew to fill the right half of the screen. My own face appeared on the left. She must have found a way to view me through my computer's videocam: my face looked just as photorealistic and reflective of real-time changes as hers.

No, not quite photo-realistic. She'd improved my real appearance, taking at least fifteen years off my real age.

I smiled, feeling giddy and pleased. My avatar smiled too.

"So did you figure out my little puzzle?" her avatar asked.

I'd temporarily put her crazy idea out of my mind. Now concern and an urgent sense of responsibility flooded me. "It's a horrible plan."

She shrugged. "There's always insect repellent. I only want to be left alone."

"We need to talk about that, Greta Garbo. If you release this retrovirus, your future won't include much solitude. You can't use the overwhelming force approach against the FBI. They have the same theory, and they have guns. Once they realize what you're up to, they'll decide you're too dangerous to leave alone, and go after you no matter what."

The words "chuckle, chuckle, chuckle," floated away from her avatar's mouth. They grew wings and flew around the screen in amusing loop-the-loops. "I'm too dangerous to go after. I have a cow mutation that turns beef bitter. A chicken mutation that turns the little suckers insanely aggressive. I can make pigeons violent, too. And dogs. Imagine the headlines: 'Pet poodle eats owner's foot.' I can alter the world's wheat supply so it's carcinogenic. It goes on an on. I haven't tested every one of these retroviruses, but some are bound to work."

My God, she was losing all sense of perspective.

"You can't do any of that if you're dead."

"It's so sweet the way you worry about me." She bit her lip. "You know, I was attracted to you way back when, and I thought maybe you liked me too. That's one reason it hurt so much when you shat on my career."

Without warning, the Brianna avatar leaned over and gave the Charlie Evans avatar a lingering kiss. I found the sight startlingly erotic.

And I wanted to tell her she'd been right. That I'd desired her more than any other woman I'd ever known, and that I still desired her.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Yet my rational appraisal of the situation kept me from saying any of this. I told myself to be realistic. After all, I'd passed the age where a man holds any physical appeal for a young woman. She was probably just teasing me anyway. Women like to do that to men.

Besides, McClury was watching.

Her avatar pulled back from its kiss and took a simulated breath. "And Charlie, you've got it backwards. I'm not too dangerous to leave alone. I'm too dangerous to kill. If I die, the retroviruses go into circulation by themselves. I have medichips implanted in my body, same as everyone. They monitor heart and brain function, right? Well, I've rigged mine up to operate a sort of doomsday machine. If a sniper gets me, hidden canisters open up all over the country. I put out the canisters months ago. It's a foolproof system. I have to signal them periodically through the Internet to keep them closed. I don't use the same signal each time; it's a complex code. Part of the code is in my head, so ransacking my computers won't solve it. One wrong signal, or too much time without a signal, and the canisters pop open. I can also send a positive trigger that activates them. Etc. Etc. Superbly designed and executed. Tell McClury."

I gaped. What did she think this was, a movie? How could she possibly believe she'd get away with it? God, she needed someone to help her; someone to balance out her madness and keep her within limits.

Someone like me.

Unfortunately, before I could think of anything useful to say, she signed off, leaving an inactive avatar that shrunk itself to an icon on the taskbar.

I slammed the mouse down on the table. What were the words she'd used? "You knew how to handle me, and in a nice way." How could I handle her if she didn't give me a chance?

A month later, I stood near a smoking barbeque in the backyard of the McClury's house in Ventura. The agent had invited me to a party at his home, and I thought it best to come.

I assumed McClury had informed his superiors about the biting housefly plague and Brianna's other threats, but I didn't know for sure. He cut me short whenever I tried to press the point, and when I tried to go above him at the FBI, no one returned my calls.

That's why I accepted this barbeque invitation. I hoped he'd invite a few administrators senior to himself with whom I could make some personal connections. Unfortunately, while many FBI agents milled about McClury's charming country property, I soon discovered that they all worked under him.

A half-acre meadow of watered grass spread out behind McClury's back porch. Behind that, the ground cover turned brown, resembling the tawny coat of a mountain lion, and rose to a hill dotted with live oaks and sage. McClury waved at me when I arrived, but remained ensconced among a group of fashionably dressed women for twenty minutes or more.

I was standing by myself at the edge of the meadow when McClury came up and tapped me on the shoulder. He seemed unusually diffident.

"Professor," he said at last, "I've been wondering. Is there any way to keep hair from turning gray using retroviruses?"

A woman holding a videocamera had come up behind us. "Turn around, McClury," she said. "Let's see that gray moustache."

"It's not gray," he said, "but it will be someday. Unless the professor can help me."

I chuckled. Setyabudi had made the same request, and my attraction for Brianna had even caused me to consider the issue for myself.

"Theoretically, yes," I said. "In fact, you could probably return gray hair to its original color. The obstacle is more political than scientific. Can you imagine

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the FDA approving a retrovirus designed for purely cosmetic effects?"

"Probably not. A pity. There'd be a fortune in it."

True. In fact, sooner or later retrovirus products like that would show up on the black market. No matter how tight the security, with enough money, someone could get access to retrovirus technology. Setyabudi himself had hinted he'd be happy to hire me away to work for him in secret—whether to create retroviruses to sell on the black market, or merely improve his personal genome, I wasn't sure.

Neither prospect held any appeal for me; I loved basic science, not engineering. Nonetheless, a growing number of people possessed the necessary skills. Even if they couldn't steal data the way Brianna did, with enough time and money they could redevelop it independently.

Loud yelps broke my reverie. McClury and I turned to stare at the dozen or so people standing next to the barbeque. Strange. They'd exploded into some kind of wild, barbaric dance, complete with jumping and arm waving.

An intense stinging pain in my forearm provided an alternative explanation for the vision. "God, that hurts," I said, instinctively cupping the skin.

I watched a housefly circle lazily. Seconds later, the back of my neck felt like someone had dripped burning solder on it.

McClury and I took off running toward the house. The crowd forced its way through the back door bottleneck and took refuge in the agent's living room.

Eventually, we stopped hurting. McClury found quantities of insect repellant and proposed returning outside. He personally tested the defense by smearing on the repellant and walking back outside. "It works," he called. "Come on out."

FBI agents, apparently, believe in the "get right back on the horse" theory. The party recommenced with remarkably little diminution of spirit. No flies bit us, and the only real loss was the food: everything tasted like DEET.

We'd lost our host, however. McClury spent the rest of the evening wandering over his property with a cell phone glued to his ear.

When I drove home that night, our two avatars waited motionless on the screen. I threw myself into the chair and typed, "Brianna, are you there?"

After a brief pause, her avatar came to life. "Oh, hi. You're back. How're you doing?"

"Oh, I just love getting bit by poisonous flies. Great fun."

"Sorry about that. I didn't know they'd start tonight."

"Oh yeah, I wanted to ask about that. Quite a coincidence."

"It *was* partly a coincidence. I planted some retrovirus near his house, and I knew approximately how long it would take for the first active flies to appear. I couldn't time it to the day, though."

"You could kill people with bee sting allergies."

"They should carry bee sting kits. Look, it's not so bad. You can undo the mutation, Charlie. Make another infectious fly retrovirus that replaces the new genes with something innocuous."

I could reverse it, couldn't I? Not exactly the way she said, though. "I'm not you, Brianna. I can't unilaterally release a plague on the world."

"It's an anti-plague."

"Doesn't matter. I'll have to get the FDA's approval, or maybe the EPA's. Or maybe the United Nations'." I don't know. I'll give the info to the CDC and let it work its way through channels."

"Whatever you want."

My mind was churning. I didn't have to let it work its way through channels. With any luck, I could arrange matters so I ran the project myself. What an opportunity!

"I hope this scared McClury enough,"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Brianna said, with a flirtatious pout. But if it didn't, tell him I have two human plagues ready to go if he doesn't back off."

It took a moment to register. "Human plagues? Brianna, don't even think about it."

"It's too late. I already thought about it."

"OK, so stop thinking about it."

Her avatar scratched its head and didn't answer right away. "Actually I already released one this morning. It's harmless. If McClury doesn't back off, the next one won't be harmless."

She released one already? Why? It didn't make any sense, even from a tactical point of view.

"I guess I shouldn't have?" She looked so sheepish I wished I could kiss her through the screen.

"Oh, God, Brianna—it's almost like you're addicted to this sort of thing. Maybe you are."

She hung her head.

I took a deep breath. "OK. So what is it? Not the one you set off already. Tell me about your big threat. The one you'll release when the Marines come after you for releasing the 'harmless' one."

"A p53 suppressor retrovirus."

P53? No, no, no, no, no.

I jumped out of my chair and paced the living room. Brianna's eyes followed me from the screen.

P53. The primary protein that prevents cancerous changes in cells.

I walked back to the keyboard, leaned over my chair, and typed, "That's genocide. Billions of people will come down with cancer if you suppress p53."

"Naah. When I remove it, I strengthen another enzyme that blocks cancer at a later stage. I've tried it in mice and it works perfectly. No p53, and no increase in cancer either."

"I don't get it then. What's the point?'

Then I saw the point.

What a strange and subtle plague she had in mind.

Back around 2000 or so, researchers had studied the effects produced in mice by increasing p53 production. They had hoped to discover a cancer cure. Unfortunately, p53 proved to be a two-edged sword. Although mice with high levels of p53 didn't get cancer, they aged at a rate three or four times faster than normal.

Intrigued, researchers tried reducing p53 levels instead. The effects were startling. Normal signs of aging came to a virtual halt. The p53 suppressed mice didn't turn gray; they didn't get arthritis or heart disease; they looked young and stayed young.

Except the ones that died prematurely of cancer. They all died of cancer eventually.

The two actions—fighting cancer while accelerating aging—proved to be inseparable, and p53 research ground to a halt. If she'd found a way around the cancer problem, though . . .

"How long do your mice live?" I asked, in trepidation.

"I haven't detected any sign of aging *or* cancer yet. I'd put the minimum lifespan increase at two to one. It could be a lot more than that. Ten to one? A hundred to one? Let's dream about it, Charlie."

I was already dreaming about it. I stood with my hands on the back of my chair, speechless with dreams.

Her avatar's words came out in italics.

In a certain busy park, a small airtight canister nestles among the foliage of an evergreen tree. When I send the signal, it pops open, dispersing virus over the crowd. Other canisters spill into ventilation ducts in office buildings.

Two weeks later, thousands of people come down with mild cold symptoms. No one pays any attention; it's cold and flu season anyway. More than a hundred infected businessmen take overseas trips. Each infected person infects ten others. In three months, the whole world's exposed to the Immortality Plague.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"What do you think they'd notice first?" she asked. "The number of people over a hundred years old? Or guys like McClury keeping their black mustaches?"

"Probably the moustaches."

Then I did a double-take. "How do you know McClury asked me about that? Did you bug his house when you put up the canister?

"No need. I listened through that woman's video camera. Every appliance is connected to the web by satellite these days, using embedded Internet II chips. Let's dream some more."

As the death rate goes down, population rises to fantastic levels. China illegalizes children; soldiers who work on a bounty system shoot kids and their parents on sight. Sweden is more civilized: every citizen signs up for voluntary sterilization. The U.S. tries negative tax deductions for dependents, but it doesn't work. Nothing works. The population crashes in famine and disease, rises exponentially, and crashes again. Only warlords and the superrich live comfortably. Everyone else starves, or live as slaves.

I cut her off. "You have this ready to go?"

"The canisters have been in place for months."

"You can't do this, Brianna. It's a nightmare."

"I *can* do it. I just don't want to. If McClury will only leave me alone, everyone will be fine." She gave me a soulful look. "I truly don't want to hurt anyone, Charlie. The thing is, I'm kind of trapped. There's nothing else to do except up the ante."

I didn't know what to say. I couldn't see any way out for her either. Not if she'd already released one human retrovirus.

"Now tell me what the 'warning' plague's going to do," I asked. But she was gone.

Two days later I found myself in the Oval Office, giving a briefing to President Scott Carson, members of his cabinet, and influential congressional leaders.

It was a heady and charged moment for me. Several of these same people had grilled me half to death during the months following my retrovirus disaster. Now they needed my help.

We started with the easy part. After half an hour, Carson asked me to head up a crash program to reverse the Housefly Plague, and I gratefully accepted the opportunity.

Then we turned to the Immortality Plague, and the discussion didn't go well. Most everyone in the room appeared to accept that Brianna could carry out her promise. However, few of them seemed to fully comprehend the danger. I painted vivid pictures of exponential population growth and its consequences, and described scenarios of utter chaos on an international scale.

All they saw, I'm sure, was themselves living forever.

I sympathized. Even for me, the seductive call of long life made it hard to focus on the consequences. If I were one of these powerful men and women, would I be able to understand immortality as anything other than a fantastic personal opportunity? Probably not.

Fortunately, this wasn't one of the periods in U.S. history when we elected fools for our highest office. The realities of terrorism and environmental disasters had caused our country to choose talented leaders, just as it had during other moments of national crisis. Carson possessed a degree in Public Health, and during a stint in the Army Corp of Engineers had managed the evacuation of New Orleans when the rising ocean swamped it. This was a President who understood long-term dangers. Throughout my presentation, his face indicated that at least one person in the room recognized the risks of immortality.

Carson paused in thought for a full

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

half minute when I'd finished, tapping his fingertips together beneath his chin. "It's a terrible situation," he said at last. "We spend billions every year to protect the buildings and bridges of this country against terrorist attacks, and billions again to keep our coastal cities above water. Now we find that not only the large and the obvious are vulnerable; we also must try to guard the very core of our humanity, the hidden molecules of our DNA."

He looked at me. "How do you propose we defend against this threat, Dr. Evans?"

"I'm sorry, Mr. President. I don't see any effective defense."

"I do, Mr. President." It was Senator Margaret Reilly. Now in her late sixties, she chaired the Congressional oversight committee charged with overseeing genetic therapy. Reilly had reduced me to jelly on several occasions during the infectious retrovirus hearings. "It seems to me rather obvious. If Dr. Evans can reverse the biting housefly problem with a second retrovirus, as he says he can, what's to stop us from reversing this Immortality Plague the same way? I say, arrest this Brianna, let her release her virus, and fix the problem after the fact."

Carson brightened. "Sounds sensible. Dr. Evans, what do you think of the idea?"

I'd expected this question, and prepared the most convincing answer I could think of. "Technologically, there's no fundamental problem. As you say, we could build a retrovirus to remove the immortality genes. If Brianna doesn't help by providing the retrovirus gene data, it won't be quite as easy as the housefly project, and yet we could do it in time. The true obstacle is human nature."

"Are you a psychologist, Dr. Evans?"

"Let him finish, Margaret," the President said.

I looked at him gratefully. "Mr. President, there are some temptations human beings simply weren't designed to face. Consider this analogy: In theory, it's technologically simple to get a heroin addict to quit—just keep heroin out of his hands. In practice, it's next to impossible. Which of you here would willingly take ten doses of heroin on the assumption that you could stop whenever you wanted? And which of you would relinquish immortality once you tasted it?"

Senator Reilly shook her head. "I don't buy it. You could release the antidote as an infectious plague. People wouldn't have a choice."

"There are two problems with that plan. First, the internationally accepted Locktight protocol bans infectious retroviruses, and with good reason. If an infectious retrovirus mutates, who knows what damage it would cause to the world's DNA? The only safe way to perform genetic therapy is to use non-infectious viruses that must be injected individually. It's a slow process, and it requires cooperation on the part of each recipient. So they could refuse."

Carson nodded.

"And that's not all. It will take years to ensure that any planned corrective virus is safe and effective. During that time, someone will leak the genetic code of the corrective virus. As soon as that happens, someone else will design a vaccination against it. Everyone who wants to live forever will fight hard to get it, and of course that means nearly everyone. How are you going to stop them?"

I looked around the room and saw the mental wheels turn. One didn't need to be a paranoid conspiracy theorist to recognize that these were particularly rich and powerful people. Many of them had democratic ideals, of course. Sincere ones. Yet the siren call of long life could pervert the intentions of even the most sincere. These people saw themselves thriving in an immortal world, and I didn't doubt that they would. I looked at Reilly and saw a powerful warlord ruling a fiefdom of starving, immortal rabble.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

President Carson's words went a long way toward setting my mind back at ease. "We thank you, Dr. Evans. I for one am convinced that this p53 mutation would be a disaster. You may rest assured that we will find a way to defuse the threat rather than go forward blindly. To put it simply, we will not immediately attack Brianna Carleton."

As we filed out, I thanked God for the rare blessing of an intelligent leader.

They might even have let her fade into obscurity—Carson could have finessed it—were it not for Brianna's disastrous decision to release a "harmless warning plague."

I encountered the first indications of the plague one afternoon while walking in Westwood, the fashionable district near UCLA. A young woman in the popular lingerie style stood beside me as we waited for the light to change. I watched her lift the back of her hand and hold it against the fabric of her white camisole. I didn't recognize the significance of her action at the time; actually, it brought back fond memories of my deceased wife and how much attention she'd paid to matching her clothes and skin tone.

The light turned green and we crossed side by side. Halfway across, she carried out another surreptitious self-check of her hand. Later that day, I saw the department administrator paint whiteout on her palm and study the contrast. This also meant nothing to me, until the following week when I saw an article in the Tidbits column of my local newspaper.

A section titled, "How gullible are you?" reported several typical stories of people taken in by con artists. It concluded with a preposterous idea that was spreading via the Internet. Apparently, thousands of people had come to believe they'd turned a pale shade of green.

I fell into fulminating curses and raced to the lab. Using a tissue sectioner, I sliced off a layer of skin on the back of my hand and examined it in one of our computer-augmented light microscopes. It didn't take long to find the signs: droplets of a green substance accumulating in cell vacuoles.

I used microtools to remove a sample of the liquid, and identified it as a carotenoid, a benign nutritional substance found in deep green leafy vegetables.

That night, I flew out to the Washington headquarters of the National Centers for Disease Control, and by the following afternoon we'd assembled the backbone of a team to create a second retrovirus antidote. In less than two years we'd reverse the infection.

Unfortunately, in as many months, all the lighter-skinned people of the world would turn a dark shade of green.

Some of the talking heads on TV predicted mass insanity leading to World War III. Luckily, things didn't turn out quite that bad. Parisians with faces the color of collards *did* sack the biology building at the Sorbonne. Still, no one died, and the incident allowed local police forces to take adequate precautions in their own jurisdictions. Riots in the rest of the world flared for a few weeks, and then petered out.

Other people responded in a manner that was more pathetic than dangerous. Italians took to wearing masks of saints to cover their green faces. It was weird to watch twelve Mother Theresas shoot forward on their Vespas when the light changed. In Tokyo, men and women wandered the streets aimlessly, touching each other on the face with wonder. The European talk show circuit broadcast endless pathetic stories of women obsessively scrubbing their skin. As one supermodel said, "I feel like there's something alien in me. I take three showers a day trying to wash it out. It's like my skin's been raped. And whoever did this, who knows what else they'll do? Can't anyone protect me?"

Still, some people welcomed the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

change. Fashion designers, for example, filled the runways with wild new styles that harmonized with the new skin tones. And raw foodists claimed the genes enabled them to synthesize protein from sunlight.

The world would muddle through until we reversed the Green Plague. I wouldn't make the same prediction about Brianna.

"OK, granted you're right," she said, "what do you propose I do about it?"

We were having one of our evening conversations. We frequently "ate dinner" together these days, and then talked for hours, each of us curled up with a laptop in our separate beds.

Four weeks had passed since the Green Plague struck, and Brianna had come round to my way of thinking far enough to admit that her life was in danger. Unfortunately, I still didn't have a good solution to her predicament. One possible way out had come to mind, but I knew she wouldn't accept it.

I offered it to her anyway. As if in passing, I mentioned Kurniawan Setyabudi and his offers to make me his personal biologist; as if by accident, I allowed his email address to tag along with an email I sent to her. I had to be careful. McClury wouldn't like it if he saw me offer Brianna an escape route, although Carson would have seen the wisdom of it.

Brianna hated the idea, as I expected. She launched into a diatribe against Setyabudi as a money-hungry anti-intellectual low-life, the epitome of materialist culture, the sort of man who deserved death at the hands of the masses. Or words to that effect.

"And you know what's the biggest regret I have about choosing the p53 mutation as my final threat, Charlie?"

"Because most people are too unimaginative to see it as a threat?"

"Besides that. Men like him will benefit most. I wish I'd used that violent poodle plague. I bet Setyabudi has a poodle. But I can't set up any new plagues now. The FBI knows where I live."

Her avatar made a brave attempt to pout, and didn't pull it off. She looked scared.

"Promise me you'll think about all your options," I begged.

She signed off without agreeing.

Moments later, I heard the unmistakable throb of a helicopter. I raced to the front door. When I opened it, I saw a young man holding his fist in a position to knock.

"FBI," he said, and flashed a badge. "The helicopter is ready for you sir."

"What helicopter?"

"The one Special Agent McClury sent to pick you up."

I didn't like the sound of this. Nonetheless, I stuffed my pockets with snacks, filled a travel bag, and followed him outside.

Several forms of transportation later, I found myself in rural Wyoming, wearing a heavy parka McClury had handed me. The agent glowed with excitement and satisfaction. His camouflage outfit rather nicely matched his green face, and everyone reeked of DEET.

"I wanted you here in case we decide to negotiate with this lady," he said.

In case! What else were they planning to do?

Starlight showed me SWAT teams and snipers taking position on nearby ridges. Armored personnel carriers rolled by, and at one point I heard the clanking of what sounded like tanks.

I zipped up my parka against the cold wind. McClury led me to a small hill filled with cameramen and reporters and left me there with orders to stay put. I stayed put, and analyzed the situation.

Why had they changed plans?

Maybe they'd figured out some way to capture her without setting off the plague. Or at least, they thought they had. *I* couldn't imagine anything that would do the trick. She was too paranoid and too smart.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

I cast around for other possibilities.

Perhaps the President had finally succumbed to the temptation of immortality. Or maybe others in the stratospheric levels of power had overridden him, people who would stand to benefit in the wild conditions of a post-Immortality Plague world. It would certainly fit with the psychology of powerful men and women.

And if that idea were true, they'd have no reason not to kill Brianna. They'd *want* to set off those canisters. The more I thought about it, the more positive I became: I'd arrived tonight for an assassination, not a capture.

This turned Brianna's calculations upside down. If she wanted to survive, she had to reverse course and threaten to stop the Immortality Plague. Then they wouldn't just kill her. They'd have to take her alive.

What could I do to warn her?

I remembered the Internet II chips in the video camera at McClury's party. If I were Brianna, I'd scan and record every possible source of data that could provide information about the scene outside her cabin. I could only hope that if I talked long enough near a random video camera, she'd overhear.

I wandered casually over to the nearest reporter, a young fellow wearing sophisticated-looking night-vision goggles. Beside him, his cameraman monitored the screen of a similarly equipped video camera.

"Hello. I'm Professor Evans. You've heard of me? The lead researcher working on an antidote to the biting flies and the Green Plague?"

The reporter pulled his goggles up onto his forehead and flashed me a deep green smile. "Professor Evans! I'm honored. I'm Frank Stanso. What do you know about tonight? Do you think she'll fight back with biological weapons?

"I'm not sure about that," I said. "Tell you what I'm wondering, though. You think maybe they plan to go ahead and kill her?"

He looked at me quizzically. "And release the plague on purpose? Why?"

"There are plenty of rich and powerful people who'd love to live forever. In fact, maybe what they're most afraid of is that she might not release it."

The idea clearly didn't make a lot of sense to Frank. He nodded politely and pulled the goggles back down.

Brianna, are you listening? Do you get the hint?

I couldn't spell it out any clearer without risking getting nailed as an accomplice.

She did get the hint. And she reacted without delay. Just not in the way I expected. The thuds of heavy explosions broke through the silence of the night.

I danced about with anxiety. Frank peered into the darkness, mumbling "oh, my God," and "that's incredible." I grabbed his shoulder. "What's happening? Tell me! Are they firing at her?"

He waved a hand at me to leave him alone, signaled to his cameraman, and pulled a microphone out of his pocket. "Patch me through, Connie," he said. "Yes, right now." His voice shifted to the controlled excitement of a professional reporter on the scene. "This is Frank Stanso, reporting live from tonight's FBI action in Washakie County, Wyoming. Something very unexpected is occurring. Moments ago, four tanks—they look like green rectangles on the night vision image you're seeing—were moving toward the cabin which is the center of tonight's action. Seconds ago, they wheeled around and started firing *toward* the SWAT teams. It doesn't look to me like they're hitting anyone. No, I'd say what they're doing is driving the men away from the cabin. I don't understand it."

Driving away their own men? Why?

Between explosions, I heard orders shouted through bullhorns, and curses and yells from every direction. I grabbed a set of night vision goggles from one of Frank's associates. Now I could see the scene for myself. Four tanks circled a

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

cabin at the crest of a hill, their turrets facing down the slope. As I watched, they rumbled into motion, spreading out in a widening circle, guns flashing bright. After each flash, the ground hundreds of feet behind a group of fleeing men exploded in a gout of light and flying dirt; in the darkness and smoke I couldn't tell whether the agents were running under their own power or being tossed ahead by the concussion of the shells. A squad of men on a hillside aimed what looked like a heavy gun at one of the tanks; moments later the gun and crew vanished in a thundering explosion.

Brianna must have hacked into the controller chips of the tanks. For years, computer security experts warned about the inherent vulnerabilities of fully computer-operated weapons systems. DOD and all their five star generals had claimed foolproof security. But when has any government outwitted a determined hacker? UCLA computer security and the FBI's cybercrime division had made the same claim, and a mere biologist had proved them wrong.

She'd probably spent months or years developing techniques to defend against an attack like this. If someone took the time to interview military personnel, I'd be willing to bet he'd uncover lots of unexplained behavior on the part of military equipment. Tanks found in different positions in the morning from where they'd been parked at night. Fighter planes whose rudders seemed to switch position overnight. Small events, too minor to cause anyone to take action, or even file a report, yet sufficient to give Brianna the practice she needed.

Still, she couldn't possibly control every weapon they turned on her. All it would take was one shell or bomb landing near her cabin. I imagined her moving joysticks in a desperate solitary videogame with real guns on the other end.

McClury and a group of his men came running out of the dark, and met a pickup truck as it skidded in from the opposite direction. McClury leaned into the bed and yanked out what looked like rifles with rockets on the end. Out-of-date weapons, I surmised, whose defining virtue was a lack of connection to the Internet. His men kneeled and aimed. How many direct hits with those would it take to burn down the cabin? Two? One?

"McClury," I shouted. "They're using you. Don't you get it?"

He looked up. "What the hell are you talking about, Evans? Men, on my count . . ."

"Don't you see? They want her to die. They want the Immortality Plague to get out. When the world falls apart, they'll do fine. But you won't."

I'm sure he didn't understand. However, he trusted me enough to try to understand, and it delayed him for several seconds. By the time he returned to his attention to the men with the rocket launchers, a jet fighter screamed in from over the cabin and dropped a bomb whose fireball obscured the view.

Where'd she gotten a fighter plane?

A second bomb landed close enough to knock us down with the concussion. I staggered back to my feet and followed McClury's men as they retreated to the next hill.

McClury regrouped his men, and gave an immediate command to fire. I held my breath and waited to see the cabin collapse in flames. Instead, explosions lit up the night well short of their target.

McClury kept his composure and issued new orders. All but four of his men would scatter into the dark and sneak back within firing range. One of the remaining agents took a large weapon from the back of the pickup, and the group set off out into the night.

The sound of helicopters drew my attention back to the sky. Three, no, four gunships; she couldn't possibly stop them all.

I heard and saw the rapid fire of a gun from a distant hill and saw a helicopter

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

burst into flame. They had anti-aircraft batteries here? Why? I thought rapidly. This whole setup made no sense. They didn't need tanks or jets to attack Brianna's cabin. It was incredible overkill.

Unless . . . unless they expected some third force to get involved.

That had to be it. The guys in power probably suspected each other of wanting to take Brianna for himself. Sufficient force would make that harder.

Or maybe they feared armed attack by combat forces of some other country, a country whose leader wanted to live forever.

Or even a rescue attempt by a total independent, someone like Setyabudi.

Another explosion lit the sky, and I got a good look at the helicopters. Those small, spidery craft had never been designed for military assault. They were fast, low-flying helicopters designed for evasion and escape. My theory had to be the right one.

A flash illuminated McClury standing on a nearby hill. The light-trail of a missile reached out from his position and converted a second helicopter into a fireball. Seconds later, the jet fighter careened in again and this time McClury and his men disappeared in a burst of light and dirt. My stomach lurched. I pulled my eyes away and studied the cabin.

The two remaining copters landed, blocking the door of the cabin from view. Frank tore off his headphones and pulled a cell phone out of his pocket. He dialed several times, and then threw the phone on the ground in a rage. The agent sitting in the driver's seat of the pickup truck shouted "Can you hear me?" into his radio-telephone at least half a dozen times before giving up the attempt.

I discovered later that Brianna had covered her escape by temporarily crashing military and civilian communications. Full system function didn't return for an hour. During that chaotic interval, Brianna stepped into a helicopter and disappeared.

Within a year, we'd removed the poison from the world's houseflies and returned them to their timeless task of annoying people and spreading disease. We reversed the Green Plague soon after.

At the same time, we worked furiously to protect the world against new plagues. After shutting down every genetic therapy lab, we put all the suddenly out-of-work experts on the job. As a first step, we installed genetic monitoring stations in every city with more than 10,000 people, and devised streamlined procedures that could almost immediately reverse the effects of any gene-altering retrovirus.

We used the system too—five times. And in the process, we learned a lot about viruses. Within two years of Brianna's disappearance, we achieved proactive capabilities in the form of a vaccine against all known retrovirus types. Six months after that, we came out with a better version, one that protected against most ordinary viruses too. Since viruses mutate, and biological terrorists would always be looking for new strategies, we provided new vaccinations quarterly, like the updated virus definitions you download for your anti-virus software.

Our efforts succeeded. Not a single plague got through to trouble the world's DNA. New crises came, though: rising waters from global warming, suitcase neutron bombs, wars in Asia and South America. The media dropped one story for the next, and soon the Green Plague and the biting houseflies and the bittersweet threat of involuntary immortality were scarcely remembered.

But I remembered. For reasons I could not explain to myself, I continually ran p53 tests on my own DNA. It didn't make any sense. I knew that no retrovirus could touch me— I'd been vaccinated along with everyone else. Yet I couldn't stop.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

And that wasn't all. Strangely, inexplicably, each negative test result left me depressed. It was if I *wanted* an Immortality Plague to wreak havoc on the world. However, I didn't. The thought horrified me.

Only gradually did the motivation for my perverse obsession come clear: it was some twisted effect of my desire for Brianna.

I couldn't accept her apparent sell out.

When you're desperate enough, you'll do anything. Still, wouldn't it rankle in time? Could she really stand a life as the personal property of some powerful leader? Or worse: had she become Setyabuti's lover, two immortals in a world of dying men and women?

My heart begged her to prove she'd remained the rebellious Brianna I knew. She could do that best in one way: release some kind of unstoppable Immortality Plague into the world, and thereby thumb her nose at her savior. Maybe one based on that synthetic DNA she'd half-developed so long ago. Our vaccines wouldn't protect against that.

I knew it was selfish for me to think like this, inexcusably unethical. Only I didn't care. I wanted her to do it.

And I wanted to grow young again. Now that it seemed possible, I craved it. I studied myself in the mirror every day; I imagined my muscles toning up again, my skin losing its wrinkles, my body restored to strength and my mind reclaiming the ferocious ambition of its youth.

Yet four years passed, then five, and my own cells still produced plenty of p53. The realization struck a constant unhappy note in my soul. Even when I received the Nobel Prize for my life's work with retroviruses, it didn't completely overcome the underlying sense of emptiness.

Then, during a reception three days after the award, a cheery idea popped into my head: Perhaps Brianna had deliberately misled me in order to mislead the snooping McClury.

Maybe she hadn't actually altered p53. She might have left the enzyme intact and instead blocked its action downstream, in a biochemical sense. In other words, despite the negative tests, we might all have become immortal anyway.

Wishful thinking, of course. But possible.

I excused myself early, drove home through a heavy rainstorm, and searched the Internet for statistics on people who lived past a hundred. I saw at once that the percentage had increased by several percentage points over the last five years.

So she really had struck back! I was stunned, and yet not surprised. Brianna was unquenchable; I'd always known that.

My elation vanished when I researched the subject further. It turned out that the rise in supra-centenarians had begun as long ago as the 1980s. Experts credited it to improved heart disease survival.

I walked away from my computer in a black mood. No Immortality Plague. No egalitarian ideals forcing Brianna to rebel against her master.

Halfway to the kitchen, something in my mind clicked, and I ran back.

I graphed the numbers. They formed a curve tipping upward. In other words, not only was the percentage of supra-centenarians growing, the rate of that growth was also increasing.

I'd need a real statistician to tell me whether these numbers represented a meaningful trend. Still, I felt encouraged enough to look for confirming data. And I found plenty of it: An up tick in life insurance profits. A recession in the funeral parlor industry. A marked decrease in cancer.

All circumstantial evidence, and yet, in aggregate, signs for the eye to see.

I'd have to go to my lab and study the downstream p53 pathways. I'd go right now.

I'd put on my coat when a voice from

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the computer speakers sent my heart pirouetting.

"I thought you'd forgotten."

Her blessed avatar appeared in a corner and grew to fill half my screen. "I never forgot," I said. "I've been checking my p53 levels every week for five years."

"What?" Her avatar stomped its foot. "Are you that much of an idiot? Charlie, that won't show anything. I meant to misdirect McClury, not you."

"It's OK, Brianna. I know now. It's OK. When did you release the virus?"

"The day after they attacked my cabin. I couldn't let Setyabudi become the only immortal in the world." She gave me a gorgeous smile.

The smile turned to a frown. "He's kept me a prisoner this whole time."

"That's terrible."

"He's only started to let me travel around a few months ago, and that's because he's focused on a new plan that doesn't need a biologist. He's planning to go to the stars."

"What do you mean? He's figured out faster than light travel?"

She was smiling again. "No. But if you have a long enough lifespan, you don't need it. And I figure we're going to live at least a thousand years, maybe lots more than that."

I struggled to take this all in.

"Let's steal the ship, Charlie, and go to the stars ourselves. I'll set out canisters again; we'll release the antidote once we're safely in space."

I was reeling now. "Antidote?"

"I felt guilty, you see, and made an antidote to the Immortality Plague."

Maybe that was the hardest of all to take in. Brianna felt guilty? I didn't know she had it in her.

My thoughts must have shown on my face.

"Charlie, be fair. Up till I released the Immortality Plague, I'd never done anything really awful. The Green Plague and the biting houseflies were harmless."

When I didn't immediately agree, she threw her hands out wide, palms up. "OK, maybe I didn't think about the psychological consequences of turning people green. Bad me. Maybe I'm not all that imaginative when it comes to anticipating what other people might feel."

I laughed out loud at the understatement. And to my total and utter surprise, she burst into tears.

"Please don't laugh at me. I've had years of captivity to think about what I did, and I hate myself."

She wrapped her arms around her body; tears poured down her face. "The Immortality Plague was an atrocity. A crime against humanity." She was shaking with sobs. "And I have no excuse. I sent out those other plagues to defend myself. But I released the Immortality Plague for no good reason at all."

It made my heart ache to see her like this. I wanted to hold her in my arms. But I couldn't. She was only an avatar.

Instead, in my gentlest voice I said, "You shouldn't have done it, I agree. However, it's understandable. Right after barely escaping that cabin with your life, you discovered that you'd become some kind of scientist-slave. People make terrible mistakes when they feel trapped. I know. Think of what I did to you."

The sobs slowed a little.

"Anyway, now that you've made an antidote, you can undo your mistake before it hurts anyone."

Soon she was only gulping, like a cried-out infant.

While I waited for her to calm down all the way, I thought of a big problem with her plan.

"Brianna," I asked urgently, "we have defenses in place against retroviruses. How will your antidote get past them?"

The sweet, familiar Brianna cockiness came back in an instant; her avatar stared at me in mock surprise. "You have a defense against synthetic DNA retroviruses?"

I almost cried then myself, with relief and affection; admiration was in there

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

somewhere too.

Her avatar stopped moving.

"Brianna?" I asked.

No answer.

"Brianna? Where'd you go?"

I heard a knock.

I was running to the door. I was yanking on the handle. I was looking at Brianna herself, standing before me as an actual person, her face shy, innocent, and beautiful, her long brown hair dripping in the rain.

We hadn't seen each other in person for almost fifteen years. The intimacy of a few seconds ago vanished. I felt foolish and awkward, old and ugly.

"I got in the car as soon as you started that supra-centenarian search," she said. She looked at the ground and rotated her body left and right, left and right. Like a teenage girl.

Poor thing. She seemed twice as anxious as me.

I pulled her inside and shut the door. I kissed her. I kissed her for a long time.

We parted to take a breath.

"Old mice show signs of reversed aging in eight months," she said. "Setyabudi is already starting to look younger. I calculate we'll eventually settle at a biological age of about twenty-five. "

So she did find me too old. I shrank back, but only for a second. I looked in her eyes and I knew she was already imagining me rejuvenated, once more in my prime.

"Young love is the purest love," I whispered

She reached tentatively toward my shoulders. I threw my arms around her neck and pulled my lips into hers. I kissed her with the ardent passion of a man who knows his life is just beginning.■

Chat online
with your favorite authors!

Meet Our Nebula Nominees **April 8 @ 9:00 P.M. EST**
Check our website for our Nebula award finalists! They will participate in this chat just days before the award ceremony.

Jacqueline Carey **April 22 @ 9:00 P.M. EST**
chats about her latest book—*Kushiel's Avatar.*

Go to **www.scifi.com/chat** or link to the chats via our home page (**www.analogsf.com**). Chats are held in conjunction with *Asimov's* and the Sci-fi Channel and are moderated by *Asimov's* editor, Gardner Dozois.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The Search for Extraterrestrial Oceans

Richard A. Lovett

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Chaos regions such as this one on the surface of Europa look very much like pack ice that has broken, drifted, and refrozen. They're one of several strong indicators that the ice may be floating on top of a liquid ocean.

Photo courtesy NASA

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Earth is dominated by its oceans. They control our weather, provide rainfall to moisten the land, feature strongly in human history, and served as the primary nursery of life through much of the geological past. Regardless of whether life originated here or hitchhiked out of the sky on a meteorite, the oceans have long been one of its primary nurseries.

It's not surprising, therefore, that astronomers have long hoped to find water on other bodies. When Galileo turned his telescope toward the moon, he saw mountains and valleys and correctly inferred that the moon wasn't just a light in the sky, but an actual place where it would be possible to stand, walk, and enjoy the scenery. But he also leaped to the conclusion that the moon's dark areas were oceans. These expanses still sport such names as the Sea of Tranquility, but they're too tranquil for even the most gentle of waves. The moon's seas are plains of dark rock; not liquid.

Nevertheless, otherworldly oceans may not lie entirely in the realm of wishful thinking, even in our own solar system. Planetary scientists now count at least seven rocky moons and planets on which past or present oceans might yet be found.[1]

The closest and most likely of these is Mars. In previous *Analog* articles,[2] I discussed the Red Planet's landforms and some of the ways in which they indicate the one-time presence of water. I also noted that the Mars Orbital Laser Altimeter has allowed the development of contour maps indicating what may be a large ocean basin in the planet's northern hemisphere—although the largest ocean that this basin could have contained would be only a fraction the size of Earth's seas.

Whether there actually was a full-fledged ocean in this basin—and when in Martian history it might have existed—is an open question. At a recent scientific meeting, one planetary scientist commented that he'd come to the meeting assuming that the prevailing belief was that there'd never been much of an ocean—only to watch his colleagues "put back" the sea a few hours before his own presentation![3]

A definitive answer may require landing a probe on the ocean's presumed shore to search for wave-lapped rocks. Meanwhile, some scientists have observed terraces that might once have been beaches. Others have discovered signs of what appears to be coastal erosion on the seaward walls of craters flanking the hoped-for ocean.[4] Based on the elevations of these features, the Martian ocean may once have been 16,000 to 23,000 feet deep. But the eroded crater walls also indicate that the ocean may not have been long-lived. Otherwise, wave action would have destroyed these features, rather than merely degraded them.

[1] There may also be layers of liquid water on gas giant planets, but this article will consider mainly bodies on which it is at least theoretically possible to land a spaceship.

[2] "Paleolakes, Jökulhlaups, and Mobergs: What Iceland Reveals About 'Wet Mars,'" Feb. 2003, pp. 52-63, and "The View from Space: Satellites Predict a Lot More than Weather," Feb. 2001, pp. 48-59. Geoffrey A. Landis has also discussed the prospects for present-day life on Mars in "Water, Pink Salt and Cold Dry Gullies: Halobacteria and the Case for Life on Mars," May 2001, pp. 48-55.

[3] The scientific meeting in question was the fall meeting of the American Geophysical Union (AGU), Dec. 10-14, 2001, in San Francisco, CA, from which much of this article is drawn.

[4] Timothy J. Parker, Jet Propulsion Laboratory, Pasadena, CA. "Topographic Evidence for a Massive Ocean on Early Mars," presented at 2002 AGU meeting.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Although these wave-eaten landforms provide evidence of a sizeable ocean, it would have been relatively small by Earthly standards. Ironically, that would have made the early Mars a safer abode for life than the early Earth.

The earliest geological epochs of both planets are called the Noachian and the Hadean, respectively. They have been described as eras in which asteroid impacts ruled the solar system.[5] These impacts ranged in size from relatively small ones—a category that would include the one that billions of years later may have killed off the dinosaurs—to monsters compared to which the dinosaur-killer would have been a gentle nudge. Based on the number of large craters on the moon, scientists estimate that during its first 700 million years, Earth was hit by 15 to 20 rocks larger than 100 miles in diameter. By comparison, the dinosaur-killer was probably only six miles in diameter.

On Earth, small impacts would have produced tsunamis, a lot of dust, and some thoroughly stirred-up landscape, but there wouldn't have been major effects on a biosphere which, at that time, would have been comprised of nothing more complex than bacteria.

The big impacts are a different matter. NASA Ames researcher Kevin Zanhle estimates that initially, each of these blasts would have filled the atmosphere with enough rock vapor to raise the surface pressure by a factor of 100. And that's just the beginning. Beneath the silicon clouds, the Earth would have been very hot—toasty enough to remain unpleasant even after the heat boiled away all of its oceans. The Kevin Costner movie vision of *Waterworld* isn't geologically possible, but Steamworld definitely is. Zanhle estimates that this condition would persist for several thousand years before the climate cooled and all that steam rained out of the atmosphere to refill the oceans.

On Mars, with less water, it wouldn't have taken as large an impact to evaporate the entire ocean—but there's also a lot less water to generate steam. An impact that would autoclave the Earth for millennia is shrugged off by Mars in a matter of decades. The less water there is, the more quickly the planet rebounds. Life could have persisted on either planet if it was deep enough below the surface not to be cooked, but the effects of a big impact are much less devastating on Mars than on Earth.

There are two eras when water may have ponded in the northern basin. One is during the Noachian period, when Mars may have been considerably warmer and wetter than at present. Later, the ocean might have reformed one or more times if volcanic activity melted enough ice elsewhere on the planet to at least partially refill it.

The earlier ocean might have been long-lasting enough for Martian lifeforms to develop. Later oceans would not have lasted that long, although they might have provided temporary abodes for dormant life to flourish and evolve.

James W. Head III, of Brown University, has modeled the fate of an ocean created about three billion years ago, when Mars was beginning to establish its present climate. Initially, that ocean would have been warm and very muddy. If it was big enough, it might have temporarily altered the entire planet's climate as water evaporated from its surface, then fell as snow in the still-cold highlands. On Earth, this snow would melt come the spring, and flow back to replenish the ocean. On Mars, spring never came and there would have been no resupply of water unless there was a new volcanic eruption.

Head's model indicates, however, that long before the entire ocean can evaporate, it freezes over. Within about 1,000 years, even a big ocean would be a solid

[5] For more on the geological periods of Mars, see http://cmex-www.arc.nasa.gov/SiteCat/sitecat2/geochron.htm.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

block of ice. That ice would then begin to sublime into the thin, cold atmosphere, disappearing to wherever it is that the rest of the Martian water has gone. The upland snows would sublime even more quickly.[6]

How long it takes for an entire ocean to sublime depends on how much dust blows onto its surface. If the dust layer is thin, even a big ocean disappears within a few thousand years; if it is thick, much of the ice may still remain today. Mars colonists seeking a source of water close to the surface and not at the super-cold poles might find the former ocean bottom to be a good place to look. It might also be a good place to look for signs of one-time life. The 1,000 years that it took the ocean to freeze solid might not be long in geological terms, but it's a near-eternity from the perspective of bacteria. There is plenty of time for microbial spores (if any) from earlier in the planet's history to thaw, flourish, and pass through millions of generations. Repeated cycles of ocean formation, freezing, and sublimation could even allow the bacteria to develop through a series of stop-and-start evolutionary cycles in which spores become ever more adept at weathering the intervening dry spells.

Colder but Perhaps Wetter

On Mars, the only "ocean" that might still exist is buried ice. For any chance of finding a sizeable body of liquid water, we need to go farther out from the sun.

Here too, the models are on the fence: maybe there's water, maybe there's nothing but ice. But liquid oceans may well exist on the moons of Jupiter, Saturn's giant moon Titan, and even (amazingly) Pluto. And if oceans can exist on Pluto, they're also possible on cold, dark worlds gravitationally torn from their stars to wander the dark interstellar void.

Of the Jovian moons, the one that most clearly has the stuff of oceans is Europa, the second closest to Jupiter. Its surface appears to be water ice, and calculations based on the moon's gravity field indicate that this water layer is probably 40 to 80 miles thick. That's enough water to make a substantial ocean if there's a heat source to melt it. And such a heat source indeed appears to exist. As Europa circles Jupiter, it encounters gravitational stresses that cause its entire mass to flex and relax like a rubber ball, repeatedly squeezed and released. Rock crystals beneath the ice rub against each other from these stresses, generating heat. Io, the innermost of Jupiter's moons, generates enough heat this way to melt rock, producing volcanic hot spots that can easily be seen from space.

Europa, farther out, is less strongly flexed, and has more time to cool between gravitational squeezes. There's still enough energy to melt ice,[7] but the question is whether the ocean floor becomes hot enough to actually do so.

Lacking a definitive theoretical answer, planetary scientists have studied pictures

[6] Sublimation works on Earth, as well. Residents of Greenland make use of it by hanging laundry out to dry on winter days when the temperature never even gets up to the freezing point. It's a stunning sight to see bedding fluttering on clotheslines strung across snowdrifts, but in the dry Greenlandic air, the moisture freezes, then sublimes away, leaving fabrics that might as well have been aired in the summer sun.

[7] Richard Thomson of Canada's Institute of Ocean Sciences has calculated that the total energy generation is on the order of 10^{13} watts, or 10 million megawatts—about one-third as much as comes through the Earth's ocean floor from such sources as underwater volcanoes and hot springs. Europa is a much smaller world, so the energy density on its ocean floor might actually be higher than Earth's.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

of the Europan surface, seeking clues to what lies below. What they see is an incredibly complex icescape that looks like immensely thick pack ice that's cracked, moved, melted, and refrozen.

One Europa specialist, Robert Pappalardo of the University of Colorado's Laboratory for Atmospheric and Space Physics, has identified several indicators that the ice might indeed be floating.

One of the best of these is a pattern of stress lines that radiate across the planet's surface[8] in long arcs. As a whole, Europa is tide-locked to Jupiter—in other words, like the Earth's moon, it rotates at exactly the same rate as it revolves around its primary, always turning the same face to Jupiter.

If Europa's oceans are frozen solid, the tide-lock should be perfect. If the ice is instead floating atop something fluid, subtle forces will cause it to slide slowly across the underlying rock, taking thousands of years to slip through a full nonsynchronous rotation. The observed stress patterns indicate that the surface is indeed slowly slipping—strong evidence that something fluid lies underneath.

Other cracking patterns are nearly as revealing. Pressure ridges indicate that segments of the ice have been squeezed together with immense force. Again, this is easier to explain if the moving plates are lubricated by an underlying fluid such as water. In places, so many of these pressure ridges lie at crisscrossing angles that photos look like close-up views of a plate of spaghetti. Unlike strands of spaghetti, though, where two ridges cross each other, the pieces of one are sometimes broken and offset, indicating that sideways movement has occurred. It appears that the surface of Europa slides along fault lines, just as happens in California each time the San Andreas Fault takes a new jolt. In the case of Europa, however, the fault lines are cracks in the ice, and "ice-quakes" result from the motion of pack ice, not continental crust.

Still elsewhere, the surface looks as though it has been pulled apart, allowing fluid material to upwell from below. When Earthly ice packs do this, they create open-water "leads" along which Arctic explorers inched their ships in slow, dangerous voyages. Europa needn't have seen large expanses of open water, but it shows many places where old ice has been replaced by lead-like patches of younger ice. Overall, planetary scientists estimate that the entire planet is resurfaced in this manner about once every ten million years. (This estimate comes from looking at the number of meteor craters pockmarking the ice. There are too few for the surface to be substantially older than ten million years.)

The ice is also dimpled with lens-shaped pits and domes sometimes called "lenticulae." Sprinkling the globe like freckles, such features appear to form when something warm squeezes into the ice from below, distorting its surface—more evidence that something warm and fluid indeed lies below the ice.

The most dramatic features of all are "chaos regions" up to 100 miles in diameter. The best known is called Conamara Chaos.

Conamara Chaos is comprised of a complicated pattern of leads and older ice. At first glance, the old ice appears to have been randomly fractured into a multitude of pieces, like a dinner plate hit with a hammer (hence the name "chaos"). But if you reassemble the pieces of old ice like a jigsaw puzzle, you find that the entire Conamara Chaos region appears to have splintered and rotated clockwise. Richard Thomson of Canada's Institute of Ocean Sciences estimates that individual blocks of ice have shifted by up to five miles from their original positions.

Thomson, an oceanographer, has

[8] This article will use the words "planet" and "moon" interchangeably in reference to large bodies such as Europa.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

computed what would happen if a large heat plume were to rise from below and melt through the ice. The answer varies with latitude, but at the location of Conamara Chaos, the plume would be about 100 miles across when it reaches the surface. It would also be rotating in the correct direction, under the impulse of the same forces that on Earth create hurricanes.

The Conamara whirlpool would have rotated much more slowly than a hurricane, but Thomson estimates that the ice blocks would have hit speeds of up to a quarter mile per hour before the open-water leads re-froze, in about a day. That's a nice theoretical match to the observed chaos structure, although all that it would take to disprove the heat-plume theory would be to find a chaos region in which the rotation went in the wrong direction.

Presuming the heat plume theory is correct, imagine for a moment what would happen to an exploration team that chose to land at the wrong place at the wrong time. The ice would splinter, shudder, crack, and start to move. Although a quarter-mile per hour is a pace far below walking speed, suddenly finding your space lander adrift on even a slow-moving ice floe would certainly create a great deal of unwanted excitement! And such events *will* happen again. We know this from the fact that Europa has numerous chaos regions. Conamara is simply the largest and best studied.

Simply because the surface of Europa shows many of the features to be expected from floating pack ice, however, the underlying fluid needn't be water. At high pressures, ice itself becomes ductile enough to flow without melting—as occurs for Earthly glaciers. One of Greenland's large glaciers, for example, has been clocked at speeds of nearly 100 feet per day. All of Europa's surface features can be explained if the planet's surface is a single, globe-spanning glacier: an ice cap rather than an ice pack. Ice plates would still crack and move to create pressure ridges. The surface as a whole would still rotate at a slightly different speed from the planet's tide-locked core. Lenticulae could be created by upwellings of ductile ice through weak spots in the surface layer. Leads and chaos regions could be created if plate slippage created enough frictional heat to cause short-lived, localized melting: the results are puddles, not an ocean. Much as we'd like to believe that there is a large ocean lying beneath the ice, the surface features seen from space don't prove that one exists.

Ocean hunters, however, have another tool at their disposal: satellite flybys that measure the interaction between the Jovian moons and the gas giant's magnetic field.

Using a principle similar to that employed by airport metal detectors, such magnetic field studies have revealed that Europa behaves as though it is an electrically conducting sphere. Ice and rock aren't good electrical conductors, so something else must also be present. The most likely "something" is salty water—in other words, an ocean.

But there is a catch. David Stevenson of Caltech University warns that the existence of a salt-water layer is deduced only by process of elimination. The magnetic-field researchers believe that Europa has an ice-capped ocean not because they're sure that's the case, but because they can't come up with a better explanation. The moment someone suggests a reasonable alternative, the ocean goes back into theoretical limbo.

How could we prove that an ocean indeed exists? One method, of course, would be to land on the surface and bore a hole through the ice. The trouble with that approach is that the technology won't be available for a few years. And drilling boreholes risks contaminating any ocean that does exist with Earthly microbes. Nobody wants to drill holes through the Europan ice until we're sure we can rid our equipment of our own bacteria.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

In the short run, Stevenson offers a simpler method for resolving the issue. Employing equipment similar to that already being used to map Mars, he says, an orbiting satellite could track changes in the surface level of the ice, looking for the sloshing of tides as the moon wheels around its orbit. If the Europan ice is merely a glacier sitting atop rock, it won't move much in response to the tides. If it sloshes noticeably, it's floating on a liquid ocean.

Sandwich Oceans . . .

Europa isn't the only Jovian moon to be subjected to magnetometer flybys. Jupiter's other two large moons, Callisto and Ganymede, have also been investigated, and to the surprise of researchers, both seem to have conducting layers. The evidence is stronger for Callisto, where it appears that the planet has an ocean "sandwich" in which the liquid layer lies beneath one thick layer of ice (more than 100 miles thick, according to Stevenson), but floats atop another, deeper ice layer. It's possible for water to float atop ice, Stevenson says, because at extremely high pressure, ice is denser than normal. The liquid ocean occupies the transition zone between dense, high-pressure ice and normal floating ice.

Having found evidence of deeply buried oceans on two moons that do not receive Europan levels of tidal heating, scientists speculate that similar oceans might occur on other bodies, even farther from the sun.

To have an ocean in such conditions, we need two things: a source of heat, and enough insulation to allow that heat to build up to the melting point of water.

The heat source is the easy part. All planets contain trace amounts of radioactive isotopes, and the decay of these elements produces a slow, steady source of heat. If we can trap enough of it, we can create an ocean virtually anywhere. On Ganymede, Stevenson says, it appears that the ice is a good enough insulator to allow a deeply buried ocean to remain liquid. Farther out from the sun, we need a better insulator—or antifreeze. (With the latter, we don't need to trap as much heat to maintain a liquid ocean.)

Both appear to exist.

The antifreeze is ammonia—plentiful in the outer solar system. Ammonia water can remain liquid down to temperatures of about -148° F, allowing radioactively warmed oceans on Triton (the largest moon of Neptune), Pluto, or even on sunless planets wandering the frigid reaches of interstellar space. Alternatively, Stevenson says, the atmospheres of hydrogen-rich gas giant planets could provide enough insulation to maintain Earth-temperature oceans simply from the heat of radioactive decay, even in interstellar space. "I think water-dominated oceans are common," says Stevenson. "If you think there is some connection between habitability and oceans, then the habitable zone in the universe is almost everywhere."

. . . and an Ocean Sandwich

For something really weird, however, we need to examine a planet-sized moon located an intermediate distance from our own sun.

Titan is the largest moon of Saturn. Big enough to be observed by telescope as far back as 1655, it is midway in size between the Earth's moon and Mars. And, says Jonathan Lunine, a researcher at the University of Arizona's Lunar and Planetary Laboratory, it may be the only moon in the solar system to have two distinct oceans: one on the surface and one in the interior, separated by a thick layer of ice.

The subsurface ocean would be a water/ammonia sea similar to the antifreeze oceans we've already discussed for Triton and Pluto. The surface ocean is the interesting one because it stretches the normal definition of "ocean."

If it exists, this ocean will be more like a thick oil slick than anything that humans would immediately recognize as

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

a sea. But however strange it might be, it would be liquid, would have wave-lapped shores, and would have tides, just like Earthly oceans. The difference is that it wouldn't be comprised of water. Titan's surface ocean would be made of hydrocarbons and would have a temperature of about -288° F.

The source of its hydrocarbons would be chemical reactions in the planet's methane/nitrogen atmosphere. Sunlight converts these two gases into a menagerie of hydrocarbons and other organic chemicals, including ethane, propane, hydrogen cyanide, and a lot of others, many of which are liquid at Titan's frigid surface temperature.

These substances would condense out of the atmosphere at a rate of about one inch every 250,000 years. This means that if the planet's atmosphere has been unchanged throughout its history (which may not have been the case), enough of these substances should have accumulated to cover the entire surface 1,200 or so feet deep. But low-resolution radar and infrared mapping have revealed that rather than being completely covered by this (presumed) sea, Titan may have a mix of lakes and icy islands or "continents" (one of which is as large as Australia). That's a lot more interesting than a world-girdling sea, because it means that there might be observation points from which explorers could watch ethane waves lap against beaches of superchilled ice.

And these hydrocarbon lakes need not be glassy calm. Another University of Arizona researcher, Ralph Lorenz, notes that even though Titan, like Europa, keeps one face always toward its primary, the eccentricity of its orbit would cause the tide to rise and fall by about six feet as the planet whisks close to Saturn, then moves farther away.

If there's wind—and cloud patterns make it appear that this could be the case—there would also be waves, although at Titan's low gravity, these waves would be oddly slow-moving by Earthly standards. Nevertheless, they would break upon the ice continent's shores, much as Earthly waves erode our planet's coastlines. Perhaps they would even erode a rugged coastline similar to that of Maine, or California's Big Sur.

Most interesting of all, this is an ocean of which we may actually see photos as soon as 2004, when NASA's Cassini mission reaches Saturn and makes its first flyby of Titan. Early the following year, a probe called Huygens will parachute to the surface for an even better view. Huygens might even survive the landing, especially if it hits a lake, and oceanographers on the design team have created it to act as a buoy if it does encounter liquid. That means that it could take depth soundings, measure wave action, and drift with wind and currents. Huygens is the first instrument package designed to do oceanography on an alien world!

Lively Prospects?

On Earth, oceans are intimately linked with life. In the outer solar system, nobody knows whether a similar relationship exists. It's delightful to envision a methane-breathing whale snorkeling the ethane seas of Titan, but such a lifeform is unlikely. We have no clue how its biochemistry might function.

A stronger case can be made for life on Europa. If there's a liquid ocean beneath the surface, it will be warm enough to support familiar biochemical reactions, and submarine volcanic vents might supply energy to fuel ecologies similar to those found beneath the Earth's oceans.

But "might" is very much the operative word. However much has been written about the prospects of life in Europan deep-sea niches, there are significant doubts about whether it is indeed possible.

The biggest doubt has to do with chemistry. Krishan Khurana, of UCLA's Institute of Geophysics and Planetary Physics, notes that liquid water and an

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

energy source aren't the only requirements for life as we know it.

On Earth, life does indeed exist in deep-sea trenches, far from sunlight, but the organisms that live there aren't as fully cut off from the Earth's surface as they appear to be, Khurana says. Although these organisms generate energy via chemical reactions quite different from those used by surface-based life, these reactions nevertheless rely on oxygen or sulfates dissolved from the Earth's atmosphere. Europa's outer ice layer may be rich in oxygen, Khurana says, but there is no known mechanism to carry that oxygen to the ocean floor.

In theory, submarine organisms might exist via an energy-generating mechanism called "methanogenesis," in which carbon dioxide and hydrogen are combined to form methane and water. The problem is that this requires a source of carbon dioxide. On Earth, carbon dioxide percolates out of submarine geothermal vents and volcanoes. But that source of carbon dioxide is slowly replenished from the atmosphere, as carbon dioxide gas weathers surface rocks that geological processes then carry deep into the Earth's mantle. No comparable processes are known to exist on Europa, and without them, it's unclear how methanogenesis might occur.

Before we dismiss talk of life on Europa as misplaced speculation, however, we need to consider one alternative niche: transient intrusions of liquid water into leads, close to the surface.

When a crack forms and fills with liquid, Khurana says, the first 18 inches or so would freeze very rapidly. But it would take 100 days to freeze 30 feet deep, and a lot longer to freeze to a depth below which sunlight cannot penetrate. Thus, each time Europa's surface cracks, it opens a skylight for photosynthesis. If photosynthesizing bacteria ever became established on Europa, they could persist in an on-and-off lifestyle, as cracks and upwellings of warm water give them a few months to grow and multiply before they are frozen back into suspended animation to await the next thaw, millennia later.

Khurana estimates that sunlight penetrating through shallow cracks could provide enough energy to create 100 tons of biomass per year, planetwide. That doesn't sound like much, but it's an enormous number of bacteria. And the best place to search for them would be in the most accessible possible places—in frozen leads close to the surface.

This means, of course, that even more caution is needed in landing on the surface of Europa than has conventionally been believed. It may not be necessary to drill through the ice in order to contaminate the Europan ocean with Earth life. Perhaps all that would be required would be to drop one contaminated object on the surface, where, years later, a Conamara Chaos-style event erupts beneath it, immersing spores for Earth bacteria into a watery niche from which they could gradually take over the planet.

If oceans are as common throughout the Universe as some scientists now believe, there may also be isolated niches for bacterial life in places that only a few years ago would have appeared impossible.

The bottom line is that however strange they may be, extraterrestrial oceans greatly magnify the opportunities for finding alien life. Just don't hold your breath waiting for the Huygens probe to send back photos of methane-breathing whales. ■

Richard A. Lovett is a former law professor turned freelance writer. In addition to his law degree, he holds a B.S. in astrophysics and a Ph.D. in economics, and writes regularly about such diverse topics as exercise physiology, geophysics, microbiology, and adventure travel for a publication list that includes *Science*, *Popular Science*, *New Scientist*, *Backpacker*, *Sierra*, *Travel & Leisure*, and *The Economist*. His latest appearance in these pages was the novelette "Equalization," in March 2003.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The Monopole Affair

Ken Wharton

Sometimes it just takes the right kind of stimulus to get people thinking in practical terms.

Topological defects, Charles mused. They just had to be. Although some bubbles in his beer were rising from random locations, most were being created at four distinct sites on the inside wall of the glass, pulsed out with a steady rhythm. Invisible defects on the inner walls must be acting as catalysts for bubble formation, he decided. But why the steady rate?

Sudden movement through the top of the glass distracted him, and Charles glanced up to see a young woman walking past his table. He knew instantly there was something odd about her, but it still took him a whopping three seconds to notice that she was navigating with a white cane.

A blind person, here in the bar? She must feel almost as out of place as he did. For the first time that night, Charles noticed just how noisy it was, how crowded, how difficult it must be to maneuver through the mass of university students. In fact, the woman had just reached a particularly dense knot of fratboys and was forced to stop. They didn't notice her, too busy shouting one-word conversations over the alt-country music.

Bubbles forgotten, Charles watched the blind woman from his tiny round table in the corner. Was she over thirty? It was hard to tell with her sunglasses. Behind her, a young man leaned down to say something in her ear, but it wasn't until she responded that Charles realized they had come in together. Then, just as Charles was losing interest, the man ventured into the crush of bodies, leaving her standing awkwardly alone.

Charles felt a flash of sympathy, and glanced around to see if there were any empty tables. As it happened, the only vacant chair in the room was currently supporting his feet.

He hesitated before speaking, not sure if he should get involved. The woman was here with someone else, after all; she might take the gesture the wrong way. But she was just five feet

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

away, and looked so uncomfortable . . .

"Excuse me, ma'am?" he found himself shouting at her. "Would you like a seat?"

She didn't respond immediately, and he was about to give up when she turned in his direction.

"Are you talking to me?" Her voice was sweet and level, with no trace of a southern accent. As Charles had suspected, she was from out of town. Although he had difficulty remembering faces, even in small-town Auburn, he was positive he had never seen her before.

"Er . . ." Charles now noticed that she was very attractive. The observation made him nervous, but it was too late to turn back. "Er . . . yes. There's an extra seat right . . ." He fumbled to remove his feet.

She walked toward him and—amazingly—found the back of the chair with her free hand. "This one?"

Charles nodded, then quickly thought better of his typical non-verbal communication. "I mean . . . yes. Yes, that's impressive how you . . ." He trailed off, mentally kicking himself for sounding so stupid.

She didn't respond, but she did sit down, leaning her cane against the side of the table. Now Charles felt even more uncomfortable, and struggled for something to say.

"Seems like a crowded place for you," he tried at last.

She smiled gently. "My brother insisted."

"Oh, I thought he was—"

"No, just my little brother. He's a senior. You're a student, too?"

Charles cleared his throat, wondering if he really sounded that young. "No, I'm a . . . I'm a professor."

"So they actually have classes here? Tommy made it sound like it's all beer and football."

Charles smiled, realizing with some amazement that he was actually watching her as they conversed. The physics department's secretary had once noted his inability to make eye contact with women, and Charles had been terribly self-conscious of the fact ever since. Still, he supposed looking at a blind woman didn't really count, especially given that he couldn't see her eyes through the mirrored glasses.

But now it was his turn to speak, and he couldn't think of a damn thing. Stalling, he took a sip of beer.

"Pardon me for saying so," she said, tapping the side of her chair, "but it seems like a crowded place for you, too."

He nearly choked. Had this woman already figured him out, without even looking at him? "I'm celebrating," Charles said after a momentary recovery. "I just submitted a physics paper."

"Physics professor, huh? Theory or experiment?"

Charles blinked. Usually the p-word yielded a look of fear and/or boredom. Her somewhat intelligent response was a refreshing surprise.

"Uh . . . theory," he finally managed. "String theory."

"Fascinating. Although I thought they called them branes these days. Or is it M-theory?"

"I'm sorry. . . . Are you a scientist yourself?"

She laughed—attractively, not girlishly—and shook her head. Her shoulder-length brown hair responded beautifully. "Freelance science writer. I did a little article on the subject a few years back. Can't say I ever really understood it. Doubt I ever could."

"Who knows? Maybe you could visualize eleven dimensions better than I can. I'm stuck looking at three all day long."

"I wouldn't recommend blinding yourself as a solution."

Charles started to laugh, then cut himself off with an awkward strangling noise. Too late, he segued into a cough.

"It's really okay," she said with a smile. "I *do* have a sense of humor."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Oh. Good. I mean . . . not that you're . . ."

"My name's Alice," she said, saving the conversation from his incompetence.

"Charles."

"So tell me, Charles, who first came up with this extra-dimension business, anyway? Seems like a lot of mental masturbation, if you ask me."

He was glad Alice couldn't see his flushed cheeks. "Well, it goes back to Einstein, I guess. Right after he published special relativity—you know, combining space and time—this guy, Theo Kaluza, thought it would be fun to work out relativity for *four* spatial dimensions."

"You physicists have a strange idea of fun," she said with a mischievous smile.

"True enough." Like forcing himself to go out on the town a few times a year, even though he knew he'd never actually talk to anyone new. But now he *was* talking to someone; a rather attractive woman who was interested in physics, no less. The thought heartened him, and he continued his explanation with renewed enthusiasm.

"And when Kaluza did the math, new equations popped out. Equations that weren't in special relativity. Equations that looked a lot like . . . well . . . the equations for electric charge. There were problems with the theory, but that's basically the motivation for the eleven dimensions we're messing around with these days."

"Eleven. Sounds like *way* too many. Do you get new equations for each new dimension?"

"Well . . . yeah, I guess that's one way to put it."

"So what do you need eleven for? There are just four forces, right? How many extra equations do you need?"

"It has to be eleven, or maybe ten, for all the math to work out. But yeah, you have a point. Throw in eleven dimensions and you're bound to end up with equations that theorists would rather not deal with. In fact, my new paper talks about one of them. String theory has a nasty habit of predicting magnetic monopoles."

"Mono-what?"

"Monopoles. Bare magnetic charge. Say, a north magnetic pole without a south on the other end."

Alice looked thoughtful. "Yes, I remember hearing about something like that."

"They're theoretical, of course. At least, no one's ever seen one. Still, they're in the equations, once you get up to eight dimensions or so. Can't get rid of the damn things."

"Interesting." She didn't really sound like she meant it, but not knowing what else to do, Charles blustered on.

"A few years back, these guys argued that you could toss out the monopole solutions, because it looked like monopoles were inconsistent with gravitons. But my paper shows that they're allowed after all, only they're in topologically orthogonal—"

A voice boomed from high above. "There you are."

Charles looked up to see Alice's brother hovering over the table, a beer in each hand.

"Hi, Tommy," she said without looking up. "This is Charles. He's a physics professor and was kind enough to offer me a seat."

Tommy nodded, smiling. "Trolling for science stories already?" Charles noticed that the brother had a slight accent. "Well, the guys are all standing over there, so . . ."

"Standing?" said Alice. "I'll think I'd rather sit, if Charles doesn't mind."

Charles nodded, avoiding eye contact with Tommy. "Fine, yes, that's . . . okay."

"Whatever," said Tommy, leaving a beer in front of Alice. "I'll let you know if we get a table." And then he was gone, back into the crowd.

"He's a good kid," Alice said quietly. "Doesn't apply himself, though. I bet you've never had him in a physics

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

course."

"No, I haven't," he said, though in truth Charles had no idea. "But he must be fairly smart—he knew you were trolling for story ideas."

She smiled coyly, which Charles found devastatingly beautiful. *If only she'd take off those glasses. . . .*

"It's too bad," he continued. "I suppose mathematical physics doesn't make for very interesting science writing."

"It's certainly a challenge," she said, nodding. "Astrophysics is easy, because you get all those pretty pictures. And I can always sell stories with potential real-world applications. But string theory is a tough sell on both fronts."

"Yeah," said Charles. "I've never even bothered to wonder if my work has any applications. It's about as far as you can get from reality and still call it physics."

At that, Alice's smile grew a little weaker. Charles wasn't always quick to pick up on social cues, but he figured she had decided not to write a story about his work. The thought made him somewhat upset, although he wasn't exactly sure why.

"Of course," he said quickly, "that doesn't mean there *aren't* any applications. I'll think about it, see if I can come up with anything. Maybe you *could* do an interesting story. I'd be happy to supply you with all the technical details—"

"Really, Charles," she said. "It's okay. I have plenty of other leads to keep me busy."

"But if I come up with anything?"

She spent a moment considering, then nodded. "Thank you, that would be very nice." She rattled off her email address, and Charles made a verbal show of copying it down, despite already having the letters burned into his memory.

"So . . ." Charles quickly cast around for another topic to keep the conversation going. "So, how did you get started writing about science?"

She smiled at him, settled back, and the stories started to flow.

Two hours later, Charles floated out of the bar, more than a little drunk. It had only been five minutes since Alice had left, but already he felt a strong desire to give her a call. It was fortunate that she had only divulged her email, he decided, dimly recognizing that a phone call at this point would be pathetic. But he had given her *his* cellphone number. . . .

Grinning at his own foolishness, he reached into his satchel and turned on the phone.

Ten seconds later, it rang.

Fumbling with excitement, he answered. "Hello?"

"Dr. Moffitt?" It was a man's voice. Charles's heart gave out a little sigh.

"Yes? Who is this?"

"I need to meet you tonight." The voice was hurried, and the background noise sounded like a highway. "But first, it's extremely important that you withdraw your paper from the preprint server. As soon as possible."

Charles stopped walking, blinked, and tried to process the conversation. "What paper?" he asked.

"The one you posted today. I'm prepared to pay you ten thousand dollars if you withdraw the paper. It's likely that additional payments would follow."

"Richard? Is this you? What sort of ridiculous—"

"The name is Afeyan; Peter Afeyan. I'm a venture capitalist, and my company is willing to pay a great deal of money to keep your paper out of the public domain."

Now Charles was *sure* this was a practical joke. "You must be looking for a different Moffitt. My name is Charles. My paper is—"

"String theory. I realize. I'm driving down from Atlanta right now, and I'm already across the state line. I can meet you on campus in ten minutes."

Charles snorted. "You're going to pay me ten thousand bucks to . . ."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"To remove your paper from the preprint server."

"It's only been posted for a few hours. How—?"

"I know. It can still be removed before many people see it, before it's sent out in a mailing. But every moment counts. Please, Dr. Moffitt. I can make this very profitable for you."

Befuddled, Charles turned around, facing back in the direction of campus. "How you can possibly think there's money to be made—"

"I have the ten thousand with me, in cash."

Charles hesitated, but only for a moment. "Okay. Outside the physics building in ten minutes." He realized he had slurred his last words, and dimly wondered if he should be making this decision after so many beers.

"Deal." With that pronouncement, the phone went dead.

Charles stared at it in his hand, convinced this must be a complete misunderstanding. But on the off-chance it wasn't, and he might get two months' salary for retracting a minor, one-note paper. . . . He jerked into motion, heading back toward campus.

He was three blocks from the department when he remembered. Friday night, before the game, the physics building would be mobbed.

Sure enough, a herd of RVs had already claimed the parking lot, with several spilling over onto the grass. In a tragically unfortunate accident of geography, the three-story physics building sat in the shadow of the true shrine of Auburn University: the football stadium. And on nights like this, all of the physics professors usually knew to stay far, far away.

Two college kids, decked out in fan uniforms, were engaged in the time-honored tradition of pissing on the side of the building. Other, neighboring streaks proved that they weren't the first. At least five kegs were scattered around the parking lot, each with its own crowd of thirsty students. Loud strains of mutually-incompatible music emerged from the campers, although no one seemed to be dancing.

He walked closer, scouting for anyone who looked out of place. It only took a minute to spot someone standing by the east entrance, not quite hiding in the shadows.

Charles approached nervously, not trusting himself to speak first. He knew it must be Afeyan, if only for the double-breasted suit and large briefcase. But somehow the combination didn't seem to fit the man quite right; maybe the problem was his dark, out-of-control moustache.

"Dr. Moffitt?" said the man in an odd accent, extending his free hand. "I'm Peter Afeyan."

Charles grasped, shook. "Can you at least tell me what this is about? What was in the paper that—"

"I'm sorry, Dr. Moffitt, but that's going to have to remain proprietary for now. We may be asking for your assistance in particular calculations, but we already have other theorists who have been helping us."

"Other. . . ?" He boggled at the thought of privately funded string theorists. If ever a field of physics was completely free of applications, this should have been it.

Afeyan bent down and cracked opened the briefcase. It was full of twenties. "You'll have to pay taxes on it, I'm afraid," he said. "We've set it up as a consulting fee. Details are underneath the money."

Charles checked over his shoulder to see if any football fans were watching this transaction. "All I have to do is retract my paper and you'll give me this case?" It still sounded too good to be true.

"That's correct. I'll wait down here if you'd like. I presume you can do this from your office?"

"I guess. I've never pulled a paper be-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

fore."

"Well." Afeyan gestured at the locked doors. "Please go ahead. There's no time to lose."

Charles nodded nervously, pulled out his keys, and entered the building. He dallied long enough to make sure the door closed behind him; he didn't want Afeyan roaming through the physics department, let alone the drunken fans.

As expected, the third-floor hallway was deserted; none of the other faculty members had chosen to be besieged tonight. A few grad students might be running experiments, but most of the labs were in the other building or down on the first floor.

Charles pushed open his office door slowly and silently, almost as if he was doing something illegal.

His computer was already on, the first clue that something was amiss. He always shut it down at night—*always*. He reached over to hit the lights when suddenly the second clue jabbed him directly in the small of the back. The object felt enough like a gun that he was willing to give it the benefit of the doubt.

"Don't move," said a gruff male voice from behind the still-open door. Charles obeyed, fear flooding through his brain.

The gun's owner closed the door gently, locked it, and then forced Charles towards his computer. "Sit down."

Charles was almost too scared to move, but finally managed the task. "Look—" he started.

"Shut up. You know the paper you posted on the web today? Well, you're going to take it off, now."

Anger began to replace the fear. This was just one of Afeyan's stooges, making sure he didn't chicken out! "Yes, I'm going to take it off! You don't need to go waving that damn gun around. You nearly gave me a heart attack!"

Charles craned his head around to view his assailant. The man looked ordinary enough; broad shoulders beneath blond hair that might have been a toupee. True, the gun was a bit out of the ordinary, as were the black leather gloves, but at this point Charles almost considered the events par for the evening.

"Now put the gun down," Charles snapped, "and let me do this."

The man raised the weapon menacingly, and for a moment Charles wondered if he had just made a fatal blunder in his semi-drunk state. What had he been thinking, talking that way to a stranger with a gun? But the moment of danger passed as the gun was lowered. Charles turned back to the computer and started in on the paper.

The process turned out to be more difficult than he had imagined. After logging onto the preprint server, he found he was supposed to "explain the reason for the withdrawal," something he didn't know how to do without sounding idiotic. He finally made up something about a crucial mathematical error in Equation 2, and then sent in the request.

Charles turned to face the blond man. "There. Finished. So was threatening me really necessary?"

The man's face was a careful blank. "Maybe not, but we didn't want to take any chances."

"Hmmpf. Well, you got what you wanted. So take your gun, and get the hell out of my office." Charles picked up his satchel.

The blond man didn't respond well to the bravado. "You first. I'm going to watch you walk out, and if you try anything, you're dead. If you tell anyone about this, you're dead. If you resubmit the paper—"

"Let me guess. I'm dead."

The man grabbed the back of Charles' collar and yanked him to his feet. "We're going out the back way."

The back? "But, but . . ." Charles cut off his protest when the gun jammed into his side. So the money was just a ploy; they weren't going to pay him after all.

"This place is surrounded by students," Charles reminded him as he was

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

led downstairs. "All I have to do is shout."

"That's why you're going out first, alone. You will walk directly away from the building. If you change course or call any attention to yourself, you will be shot in the back. Walk until you get to the street."

Already they had reached the loading dock; this was happening too fast. "Why? You're going to have Afeyan follow me?"

The blond man just gestured toward the door. "Go."

Charles pushed it open and stepped outside, half-hoping that this side of the building would be covered with fratboys. No such luck—although somebody, way off to the right, was throwing up in the bushes. *Not exactly hero material.*

He desperately wanted to do something clever and unexpected, but nothing came to mind and he found himself obeying orders to the letter. He finally reached Samford Drive, turned left, and double-timed it back toward his parked car, often glancing over his shoulder to see if he was being followed. He didn't notice anyone, but that just made him all the more nervous.

As he reached the edge of campus, he realized that they might not be following him at all, but simply waiting for him to show up at his car. Without transportation it would take thirty minutes to walk directly home, but at least *that* would be unexpected. Charles darted across an intersection, almost getting hit by an RV, and quickly turned down the darkest street he could find. Clutching his satchel tight to his chest, he began the long walk.

His thoughts took a while to settle on one topic, bouncing from the money to the gun to Alice and back to the gun again. What was so important about his paper? He felt a quick burst of pride that he had worked out something so important, and then immediately sobered as he realized string theory couldn't have any near-term applications.

A mere block away from his house, he saw the flashing lights, and he stepped into the trees. It was the sheriff's car, Charles saw, parked directly outside his little two-bedroom. His front door was open, framing a man's outline, and Charles edged closer to see it was the sheriff himself. *How did they find out?* he wondered, and was about to step into the open when a second person joined the sheriff in the doorway. This outline was unmistakable: it was Peter Afeyan.

Charles shrunk back into the darkness, wincing. Afeyan was in league with the sheriff? What had he told them? Paranoid conspiracy theories danced through his head; he had seen enough movies to know that once the evil rich guy teamed up with the cops, you were on your own. The blond man's threat rang in his head, and Charles suddenly knew he had to get as far away as he could.

The obvious places to run—Samuel's house, the gym—were, well, too obvious. Ditto any of the other professors in the physics department. But who else did he know? His solitary life was doing him no favors tonight.

Although, he *had* just met someone new. . . . He pushed the idea away, knowing that it was just his hormones talking. He didn't even know which hotel she was staying at, for crissakes!

How many hotels are there in town? Her last name's in the email address. . . .

It's a stupid idea, he told himself. Stupid, stupid, stupid. He wasn't going to track down Alice tonight, not if his life depended on it.

Charles watched Alice's cane emerge from the elevator into the lobby of the University Hotel, followed by Alice herself. She was wearing what appeared to be a hastily-assembled jogging outfit, and looked rather nervous.

"I'm over here," Charles whispered from the alcove behind the payphones.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Thank you so much for coming down. I'm really sorry to bother—"

"What's going on?" She faced him, but didn't approach. "You sounded awfully worried on the phone, and I was surprised that you think I can help."

"I just need to be where no one can find me, just for tonight. I was hoping you could rent a room here for me, under your name. I'll pay you back, of course."

She stood silent for a few breaths. "Frankly, Charles, I'm not sure I want get involved. Can you tell me what's going on?"

Charles looked around the deserted lobby before launching into a hushed two-minute version of the evening's events.

"Not going to the cops seems rather stupid," she said bluntly when he had finished. "What do you hope to accomplish here by yourself?"

"I just . . . I just need a night to collect myself, figure out what's going on."

"And you want an anonymous room." She sighed heavily. "Okay."

Twenty minutes later, lying on the hotel bed, the sudden ring of the telephone shocked him into a sitting position. Who could have known he was here? Unless. . . . He cautiously picked up the receiver, but didn't speak.

"Charles? This is Alice."

He let out a breath. "I was hoping."

"I've been thinking about your paper, and why it might have caused such a stir."

"But you hardly know the first thing about it. I just told you—"

"Monopoles, you said. Magnetic monopoles. Well, what if someone has already found one, and they want to keep it secret?"

He smiled. "Doesn't make any sense. My paper's not about how to find a monopole, it's some obscure mathematical detail about interactions with gravitons."

"Hmmm. Still, I think you're too focused on the details. Try to look at the big picture. What could be in the paper that might tell the world something they didn't know?"

Big picture? This woman was starting to sound like his old college roommate. "Look, there aren't any monopoles. There have been careful searches. And even if someone found one, there would be no reason to keep it secret. It's not like there are industrial applications for theoretical particles."

"What sort of searches? How did people look for them?"

"Well," Charles stalled, thinking furiously. "Iron deposits. Monopoles get trapped in ferromagnets. But if you heat iron above the Curie point, the monopole should drop right out. I think they heated up a whole bunch of iron, right over a detector. Nothing."

A moment of silence, and Charles briefly wondered if maybe he shouldn't be so hostile to her ideas. She was just trying to help, after all.

"Wait a sec," she said. "Gravitons . . . that's the particle that carries gravity, right? What did you conclude in your paper? What's the connection between gravitons and monopoles?"

"That they're consistent; you can have them both in the same theory, so long as they're topologically orthogonal."

"English, please."

"So long as they don't . . . interact."

Alice laughed. "Don't you get it? Don't you see?"

"Look," he said. "This is just some little math detail that—"

"Monopoles don't fall. In the experiment, you said the detector was set up underneath the iron. Then you publish a paper showing that monopoles don't fall. You just showed the experiment was flawed."

Charles couldn't even manage to open his mouth. Monopoles don't fall? Yes—perhaps that was the obvious conclusion to his work, the big picture he had never bothered to consider. Monopoles were expected to have a

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

huge inertial mass, but if they weren't affected by gravity the relevant forces would be dominated by magnetic fields. Maybe the experiments *were* flawed. . . .

"Before I called you," Alice continued, "I called my roommate and had her do a search of my computer files to see if I had ever written anything about monopoles. She only found one little note, in this article I did on ball lightning."

"Ball lightning?" Charles finally found his voice. "Isn't that like UFOs and Nessie?"

"No, it's real, though unexplained. Over ten thousand detailed sighting reports, and they're all similar, even though most people don't know much about it. It's almost always sparked off by regular lightning, and you get this glowing ball that starts floating around. The ball lightning follows wires, it can pass through closed glass windows—"

"Interesting, but what's your point? How do monopoles tie in?"

"I don't know. From my note, it looks like someone mentioned monopoles as a possible explanation of ball lightning, but it doesn't say why. I was just thinking, if you really could make a ball of energy like that . . ."

An application. Charles was getting more and more impressed by this woman. "But there's no way monopoles are the same thing as ball lightning. They're subatomic particles! How could anyone imagine—"

"You're asking the wrong person, Charles."

He glanced up at the window, having already noticed that the hotel was directly across the street from the main Auburn library. Would anyone think to look for him in the stacks? He decided to risk it.

"Alice? I'm going to do a little research. If I find anything . . . do you mind if I stop by your room? I'm not sure where you are, though."

"Um, okay. Why don't you just knock on the wall?" A thumping sounded from behind the bed, and Charles instinctively jumped to his feet.

"Er, wow. Your hearing must be fantastic."

"No, Charles. You don't need to be a mathematical physicist to subtract room numbers."

After deciding it was appropriate, Charles allowed himself to laugh. And for the first time in years, he found that he actually enjoyed it.

"This is fantastic," Charles muttered as Alice let him into her room. His nose was buried deep in the fresh photocopy of the Modern Physics Letters manuscript. "It was published in 1990, and hardly anyone has referenced it!"

A search on 'monopole' and 'ball lightning' had turned up exactly one hit, a short theoretical paper written by some Russian named Korshunov. Charles scanned it for the fifth time, the implications quickly sinking in.

"Care to share?" Alice walked back toward the queen beds.

"Okay. This paper looks at the effects of a magnetic monopole in one atmosphere of nitrogen."

"Nitrogen?"

Charles shrugged. "That's how a physicist would describe the Earth's atmosphere. Oxygen's just a second order effect."

"I hope you never get involved with clean air legislation."

"The point is, that everyone knows that monopoles induce protons and neutrons to decay."

Alice sat down on the edge of the bed. "Not everyone, I can promise you that."

"Well, take that as a given. So this Russian guy figures out what would happen if a monopole decays one of the protons in a nitrogen nucleus. The nucleus starts out with 7 protons and 7 neutrons, and afterwards you're left with 13 nucleons, some decay products, and a whole bunch of energy."

"But—" Alice wrinkled her nose.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"No, hear me out. He computes that the extra energy is enough to make the nucleus completely fly apart and still give each nucleon about 3 million electron volts. The 6 protons would fly out and ionize the surrounding air, and the range of 3MeV protons in air is 15 centimeters. That's almost exactly the average reported radius of ball lightning!"

"Slow down, Charles." Alice sat silent for a few moments before speaking again. "I don't buy it. Even if a monopole can explode a nitrogen nucleus, even if it ionizes a sphere of air, you're forgetting the most important feature. Ball lightning is triggered by regular lightning, or at least an electrical spark. Cute idea, but it doesn't fit the facts."

Charles sat down on the opposite corner of the bed, smiling. "He talks about that, too. It turns out that nitrogen gas—N_2—is diamagnetic. It would avoid a magnetic charge like the plague, so the monopole could never get close. But if a spark comes along, the molecules break up into atoms. And nitrogen *atoms* are paramagnetic; they'd swarm right to the monopole and start the chain reaction."

Alice slowly nodded. "Maybe ball lightning follows wires because of the magnetic fields. And if you're right about the string theory stuff, it wouldn't fall; it'd float, just like ball lightning does. Maybe it could even pass through a pane of glass; it's only a subatomic particle, after all."

"Which all means that monopoles might really exist. And maybe Afeyan's company has gotten a hold of one. I just can't figure out what's in it for them."

"What's wrong with the power plant idea?" Alice asked. "Get a bunch of monopoles together, make some ball lightning—"

"Only if you had a *lot* of them. According to this paper, you only get 90 kilowatts per monopole. Maybe you could get that number a little higher in a pressure chamber, but that's still not enough to change the world."

"Hmm. So you have something that can turn mass into energy, but not at a very high rate. What about spaceship propulsion?"

Charles stared at her. "How many different science topics have you written about?"

"Think about it. If you had a monopole on your satellite, maybe you could power the thing for centuries with just a little flask of nitrogen for fuel. And if you had enough monopoles, you might even be able to make an interstellar drive!"

"Come on, Alice. This is serious."

"I'm being perfectly serious. Sounds like it's as good as an antimatter engine, from an efficiency standpoint. Although I suppose if you only had a single monopole you wouldn't want to launch it into space. Still, I bet there are tons of applications for this thing. What else can you think of?"

"Well . . ." Charles didn't know how to add to Alice's list, but he wanted to show that he was just as clever as she was, so he forced himself to brainstorm out loud. "Okay, so you have something that can make a bunch of high energy protons and neutrons, all coming from a tiny area, which gives you a pretty high flux. . . . Nuclear medicine! You could probably breed a whole bunch of medical isotopes in a tiny facility. This could be worth hundreds of millions to hospitals alone."

Alice's nod made Charles feel better than he had in years. Here was someone who was bright, attractive, and would never judge him for the way he looked. And he got the feeling that she actually liked him.

"Oh, crap." A very unhappy look spread across her face. "Did you say . . . *nuclear* isotopes?"

It took his brain five seconds to catch up to hers, at which point his euphoria drained promptly away. "Oh, crap," he echoed.

After a full hour of talking in circles, they had gotten exactly nowhere. Each time Charles thought he had found a

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

showstopper—some reason why you couldn't use magnetic monopoles to breed plutonium—Alice would find a way to get around the problem.

The low power output from a monopole could be enhanced, Alice pointed out, by the uranium itself; each input neutron could create a few more. Indeed, the low power was the scariest feature of the whole process—with a single monopole, any basement in the world could be transformed into an effective nuclear reactor. Keeping tabs on full-scale power plants was difficult enough; this would make the job all but impossible.

"So what if monopoles *can* breed plutonium?" Charles finally conceded. "I guess that would mean that Afeyan probably isn't working for a company." He pictured the man's dark moustache and images of terrorists sprang to mind.

"Or maybe he really is. A company willing to sell their product to the highest bidder."

For some reason, that scared Charles even more than the terrorist image. "So what do we do?"

Alice felt her own face with her fingertips. "You said he's already gone to the local police, so you might as well think big. Maybe go straight to the FBI, in Atlanta."

"I'm not going to just call them." An image of the blond man's gun flashed before his eyes. "If Afeyan finds out I'm onto him, I'm as good as dead. Even driving to Atlanta would be risky—I'm sure they're watching my car."

"You could take the airport shuttle with me," Alice said. "I'm leaving after the game tomorrow."

The game? He blanked for a moment until he remembered the RV-filled parking lot. "Oh. You're actually going into the stadium?"

"My brother promised he'd play commentator. He's been trying to get me down here for years."

Down here. Charles felt his heart sinking as he realized just where the airport shuttle would be taking her. Earlier tonight, at the bar, she had talked a bit about Atlanta, and he had just assumed that she lived there. Even though the city was across a state line—and in a different time zone—it was still only 100 miles away. Distant, but not impossible.

But she was flying out—she wasn't from around here after all. And she was leaving tomorrow. He likely wouldn't see her ever again, not unless . . .

"Yeah, that's a great idea. Shuttle's picking you up outside the hotel?"

"5 o'clock."

"I'll be there. But first I need to arrange some insurance."

The next day brought perfect football weather. A half-dozen cumulus clouds dotted the blue sky, and the breeze from the north was just brisk enough to offset the sun's warmth. Charles felt the clean air penetrate his mind, almost offsetting his lack of sleep.

He joined the thousands of red-shirted fans milling in front of the physics building while the pre-game show blared from inside the stadium. The football jersey and cap had cost him most of his remaining cash, but the anonymity was just what he needed.

Getting close had been easy; it was the last fifty feet that would be a trick, especially if the physics building was under surveillance. Most of the fans were heading straight toward the stadium, and he tried to stay in the thickest clumps, watching for his chance.

The game had already started by the time he saw an opening. A dozen students had approached the locked front doors of the physics building. Charles cut across the lawn to join them.

"Locked," one of the students was saying, peering through the glass.

"I *really* have to pee, Alex," whined one of the women.

"One sec." Charles pushed his way to the front and unlocked the door in a quick, practiced motion. They all filed in, and Charles made straight for the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

stairway. "Make sure it locks behind you," Charles said to the group, then sped up the stairs.

As he neared his office, he took a deep breath, remembering what had happened last night. This would be the most dangerous part, but a few minutes was all he needed.

The computer was still on, but this time he checked behind the door first. All clear. Charles nodded, sat down at his desk, and quickly got to work.

He almost missed the shuttle. After sneaking out of the physics building, Charles had hovered around the crowded downtown area until a quarter to five. Then, walking slowly to the University Hotel, he saw that an airport shuttle was already parked out front. He picked up his pace for the final few yards, and had just reached the rotunda when a police car pulled into the driveway, directly in front of him.

Charles stopped and bowed his head, hoping the cap would shield his face. He nervously watched as a large deputy slowly extricated himself from the cruiser. Just forty feet beyond, he saw Alice's brother helping her into the shuttle van, but Charles' escape was blocked by the deputy.

Still, the deputy hadn't seen him; he looked to be heading for the hotel lobby. Charles waited at the edge of the rotunda for as long as he dared. Then, just as the shuttle began moving, he ran forward and motioned for it to stop.

"Thanks a lot," Charles said to the driver while pulling open the side door and stepping inside. A quick glance at Alice's smile revealed that she recognized his voice. The only other passenger was an elderly woman, sitting next to Alice, so he slumped into the back row, took a deep breath, and glanced out the side window towards the lobby.

Through the large hotel windows he could see the deputy. The man was facing the other way, talking to the receptionist, who in turn was pointing a finger in the direction of the shuttle. The deputy slowly turned his head to look, and Charles froze like a rabbit. Their eyes locked.

Shit.

Charles turned his head away, but already knew it was too late.

Shit, shit, shit.

The van lurched into first and turned left onto College. It was all Charles could do not to check if the deputy was sprinting for the cruiser.

"I'm glad you made it," Alice said, turning halfway around to face him.

"Er . . ." Charles wanted to tell her everything; what he had done in the physics building, how happy he was to see her again, that he had just been spotted by a deputy. . . .

He had been spotted, and the game was up. The shuttle would be pulled over, Charles would be arrested on some bogus charge, and Afeyan would get a hold of him. And if they found out that Alice was in on the monopole secret, she'd probably be taken, too. Maybe they'd both be killed.

"I'm sorry," Charles said to Alice. "I think you must have me confused with someone else."

Alice started, almost spoke, then turned back to face the front. "I'm sorry sir," she said after a long moment. "My mistake."

The ride to Atlanta passed in excruciating silence. As the minutes ticked by without any police sirens, Charles began to wonder if he might have gotten away after all. And Alice was just inches in front of him . . . would it really be so bad to talk to her?

But he wasn't free yet, and the driver might be quizzed. As much as it pained him, he didn't want to put her in any more danger. Charles settled back in his seat, closed his eyes, and tried desperately to relax.

"What airline?" asked the shuttle driver, when they were finally pulling into the terminal.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Both Alice and the other passenger said 'Delta,' so Charles followed suit.

Delta? Alice could be flying *anywhere*. He had to get more information than that.

"Where are you heading?" Charles asked the other passenger as the van pulled to a stop.

"Chicago," she said. "You?"

"San Francisco," he lied. "And . . . how 'bout you, ma'am?"

Alice turned to face him. "Actually, I live here in Atlanta. This is just where my housemate is picking me up."

Despite his nerves, Charles managed a grin. She *did* live in Atlanta. Now if only he could get to the FBI before Afeyan's goons found him. . . .

The side door opened, revealing two suited, shaded men.

"Dr. Charles Moffitt?" one of them said, flashing identification. "FBI. Will you come with us please?"

Charles looked them over, trying to decide if they were for real. "Where?"

"Downtown office."

"And if I refuse?"

The man responded with a toothy smile and a tiny, quick shake of his head. Meanwhile, the other passenger was shrinking away from both Charles and the agents.

Charles exhaled sharply, trying to control his fight-or-flight instincts; neither seemed very practical at the moment. He glanced at Alice, who was also staying out of the confrontation. If only he could have safely given her an encouraging smile. . . .

"Well, then," he said, getting out of his seat. "I guess we'd better get going. I have the feeling we'll have lots to talk about."

The interrogation room was rather pleasant, Charles decided. Perhaps stark white walls and hard chairs were reserved for the hardened criminals; this room had couches, a nice wooden table, and even a couple of paintings of fruit.

"You know," Charles began as the door opened and the two agents entered. "You really can't go wrong with fruit. Tasteful, relaxing . . ." He trailed off just as a third person entered the room. It was Afeyan. "Shit."

"Nice to see you, too."

Charles instinctively looked around to see if another exit had magically appeared. "I'm not the only one who knows," Charles said quickly, before anything could happen to him. "I sent off a bunch of emails this afternoon. Silencing me won't do you any good."

Afeyan squinted and sat down opposite Charles. "Let's start with yesterday. Why didn't you take the money?"

"You know damn well why I didn't take it."

"You saw through my businessman story?"

"So you admit it! Who *are* you?"

A tiny, nervous pause. "DoE."

Charles gave an incredulous laugh. "Energy? Not likely. Why the fake cover story?"

"We have our reasons."

"Just like you had reasons to send someone into my office to put a gun in my back?"

Afeyan stared at him blankly, and Charles felt a hint of doubt enter his mind. Had he missed some part of the big picture *again*?

"There was someone else inside the physics building?" Afeyan asked while laying his badge on the table.

Charles studied the ID, then looked to the other two agents for confirmation. Could this be an enormous put-on? Inside the Federal building?

And then, for the first time, he stopped to consider the possibility that two unrelated groups had wanted him to remove his paper. One was the government, no doubt worried about potential for nuclear proliferation. But who was the blond man working for?

"You're not the only people trying to keep this a secret," Charles said at last.

A minute into Charles' description of the office incident, Afeyan flipped open

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

his phone and ordered an investigation team to Auburn. "*Damn* but I wish we'd known about that yesterday," Afeyan said to him after he completed the call.

"Well, it's not like he's going to have finished breeding plutonium in the—"

Afeyan's expression cut him off in mid-sentence. After another sideways glance, both of the FBI agents quickly got up and left the room.

"How much do you know?" Afeyan asked when the door had firmly shut.

Charles regretted that he had spoken. "I don't have to tell you what I know. I want a lawyer."

Afeyan grimaced. "The whole point of the fake business was to keep you from making that particular connection. Guess we'll have to get you a Q-clearance." He flipped open his phone to make another call, then froze. "Those emails you sent out. You didn't. . . . You wouldn't have. . . ."

Charles didn't have to speak; his expression gave him away.

"Jesus!" Afeyan sprang to his feet and pounced towards Charles, banging his palms flat on the table. "What could you possibly have been thinking? How many emails? Two? Four? I need names and addresses of everyone who might know."

Charles winced, but maintained eye contact. "No."

Afeyan leaned forward even further, so that their faces were just inches apart. "You can't even fathom how out of your league you are."

"Yeah? And you can't hide this anymore. That guy in my office proves that the secret's already out. Whoever he represents, *they're* the ones who want to keep it under wraps. The people you're trying to keep this from already know, and the people who could do the most good with it don't have a clue. Don't you realize what a fantastic discovery this is? I mean, we're talking about magnetic monopoles!"

"We already have dozens of physicists working on it."

"And now you're going to have thousands more. Everyone I know got an email today with a copy of my paper, the ball lightning info, even the nuclear issues. And they all have instructions to go public if they don't hear back from me."

"You're a fool," Afeyan said, but he did ease back into his seat.

"Yeah, maybe. But there's more to monopoles than nuclear weapons. It's time to start looking at the big picture."

Charles couldn't decide who was more dumbfounded at his own words.

They didn't let him go for another hour, but it seemed that the email threat had worked. Maybe they would ransack his computer, maybe they would tail him for months, but for now he was apparently free to leave. He strode out through the reception area with a nervous smile, avoiding as much eye contact as possible.

And as a result he almost missed her.

She was sitting on a small loveseat opposite the receptionist's desk, holding her cane with her knees. As he stumbled to a halt, she looked up in his general direction with a questioning expression.

"What are you doing here, Alice?"

At hearing his voice, she bestowed him with one of her devastating smiles. "I thought you might have trouble finding your way through downtown Atlanta." She extended a hand, and he pulled her to her feet. The maneuver left them standing awkwardly close to each other, but Charles didn't back away.

"As a matter of fact," he said, "I *could* use a guide. I just don't really know where I want to go."

She pulled off her sunglasses, and for the first time Charles got to see her eyes. Hazel. Slightly unfocused, but he found them beautiful all the same.

"You know," said Alice, looking right through him. "I think maybe that makes us the perfect team." ■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The Death Addict

Larry Niven

Taking a long view can have a downside, too. . . .

The Draco Tavern was nearly empty: just me and the bugs and Sarah. Sarah was complaining about the expanding universe.

She's an angular woman with solid and elegant bones, not much flesh to cover them. She'd introduced herself to me: Dr. Sarah Winchell, anthropologist, a woman in her forties (a bit younger than myself) who had lived with apes in the wild and had now come to confront aliens. I'd have expected her to be overspecialized. Her knowledge of cosmology surprised me.

I'd brought her two Mai Tais, with popcorn for the Bebebebeque. Now she was drinking club soda. Her speech stayed lucid and brisk.

"The universe is expanding," she told the ring of bugs. "Fine, I can live with that, I grew up knowing that. But the expansion is *increasing*. Getting faster. What could be the *purpose* in a universe that is forever blowing apart?"

She sat in an arc of chrome yellow bugs each about fourteen inches tall, perched around the rim of the big table. They buzzed. Their translator said, "Purpose you expected? Examine your contract!"

She laughed.

The Bebebebeque were a hive mind. They spoke with one voice. "To isolate cultures may be a way to keep novelty in the universe. Too easy communication is making the human race too uniform, is it not?"

Sarah laughed again. "We're not uniform!"

"You seem so to us. For purpose, will you have entertainment? The puzzle of how to build civilization changes with time. Tools are invented, then better tools. If this goes on, all problems may be solved, all tools reach their perfect state. It may be that a universal expansion propelled by dark energy is expected to compensate, make communication more difficult, puzzles more interesting. Here enters Bazin; shall we

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ask him?"

She turned to see who had come through the line of airlocks.

Bazin was an aerodynamic shape. He might have been mistaken for a thousand-pound turtle, but he moved more briskly, even with sixty pounds of life support and sensor gear mounted on his shell. I'd spoken with him when we arranged for CBS to interview him.

Sarah said, "I've seen Bazin on television. Is he, what, a philosopher? Cosmologist?"

The Bebebebeque were amused. "No!"

"I thought he was something like a stunt man. Rick?" She turned to me. "Do you know—"

I said, "Even before *Fly By Wire* made orbit, my customers all knew he was coming." I poured out a row of tiny golden seeds in front of the Bebebebeque, and gave Sarah her water. "Out there among the stars, he's a star. Bazin is a daredevil, a risk taker. Maybe he does some exploring too, but mostly he's looking for the biggest thrill. He makes, um, entertainments. Wire him up and you can record what he experiences. If he ever gets killed, they'll record that too."

I stepped outside the privacy shield around the big table, so he could hear me, and shouted, "Bazin!"

Bazin swerved toward us. The turtle-analogue's own voice was a series of eructations from under his flexible shell. His translator cried, "Rick! What is the topic?"

I said, "The topic is cosmology."

He joined them at the big table. But more customers had come in, so I missed the rest of that conversation.

Most of Earth has to put up with television sets, but the Chirpsithra had long since set up a huge holo wall in the Draco Tavern. Generally we let it jump randomly between news channels. Bazin was with us few days later, while we watched the *Today Show* interview.

"I haven't decided what I'll do on Earth," Bazin's image told Wade Hannofer, *Today*'s talking head. "I don't know what Earth has to offer yet, and of course local governments have territorial rights. I welcome suggestions."

Hannofer asked, "Have you seen the Grand Canyon?"

Bazin brushed it off. "I have viewed Valles Marinaris on Mars. When I am done with Earth, I will sail it in a balloon."

"Mons Olympus?"

"Too shallow. A climb would be a mere walk. Maybe I'll climb Everest." In closeup I saw the gleam of his shell, polished to a mirror. The Bazin beside me had lost some polish. A webbing of old cracks showed deep in his shell. I remembered an actor, Jackie Chan, who had a scar for every movie he'd made.

The image of Wade Hannofer waved around at the image of the Draco Tavern, "Some of the visitors here know when they'll die. Some are immortal. What are you?"

"I have longevity," Bazin said. "Nanosurgery has turned off the death wish in my genetics. I may be killed, but I will not die naturally."

Afterward Bazin asked me, "Did you enjoy the interview?"

"They cut too much," I said.

"I was only talking. They'll pay more attention when I test the Earth for its potential."

We watched Bazin as he went about the Earth. My customers came less often, though *Fly By Wire* continued to orbit the Moon.

In Disneyland Bazin took the "Star Tours" ride three times straight.

In a movie theater, the only viewer, he watched *Nightmare on Elm Street*, *The Thing*, and *Die Hard*.

He made news by riding roller coasters: the tallest, the steepest, the fastest. At all three parks they had to alter a car for him.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The commentators were getting disgusted when Bazin moved into Phase Two. He strung a wire across the Grand Canyon and crawled across it—with a groove stapled to his belly plate, and a small pack added to the gear on his back. We learned later that that was a pop-out hang glider.

He went hang gliding, using his own aerodynamic shape and modified Swim-Fins on his flattened hands and feet to steer toward a target, popping his parachute at the last possible moment.

He jumped from the Brooklyn Bridge with a bungee cord, after elaborate testing.

He went whitewater rafting on the Colorado River. The humans wore life vests; he wore artificial gills. When the raft tumbled, his shell bumped rocks until he could recover.

I began to see elements of Bazin's style. He did every dangerous thing in the safest possible fashion.

He must have studied Earth's history of flamboyant stunts. Most of what we had to offer didn't apply to him. On Earth he needed life support, but where did life support end and protection begin? With his shell and his low center of gravity and an oxygen source, he could plod up Mount Everest with no danger. With sufficient padding he could go over Niagara Falls, and so what? What is skydiving if you have antigravity?

In his absence the Draco Tavern's clientele discussed his adventures. They told of his testing new forms of armor, ballooning through a superJovian free floater, skating across a lake of molten sulfur.

On Earth, a chartered aircraft set him down at the South Pole, with equipment piled on a dogsled and more balanced on his shell. He walked out over several weeks, pulling the sled. The huskies he treated as pets.

He walked through Death Valley, carrying a small version of what they sold in the Sahara and Los Angeles, a device that condenses water out of the air. I wondered why.

After seven months' absence, Sarah Winchell came back. The Tavern was empty. She picked the big table. I brought cappuccinos and joined her.

"I've been on a Stephen King binge," she said.

I said, "He was good."

"I've got his whole library on here." She tapped her bookplate. "When you spend a lot of time traveling, you need a good library. Otherwise you'll go nuts. But I've been wondering, why do we want to be scared?"

A trio of brown-furred quadrupeds with manipulators around their mouths joined us but didn't interrupt. I said, "Maybe we just want to forget what we're really scared of."

Sarah asked, "What would that be?"

I said, "Taxes. Terrorists. Slipping on a rainy sidewalk. Cancer. If we do everything right, we grow old. Well and good. Most star traveling species know roughly what that means for them. For a Flutterby, it's rebirth as a brainless mating machine, ecstasy before death. For humans, it's swollen joints, failing organs, maybe Alzheimer's. You Horka, you have longevity, don't you? What do you see in your future?"

One of the furry quadrupeds answered, "I see what was always my doom. Bones turned brittle, nerves slowed, until a prey takes me as predator. We only postpone. But other species may postpone forever. They can lose all sense of place, of continuity. Like this one," as a Chirpsithra joined us.

"We're all afraid of some things," Sarah said. "A writer like Ray Bradbury can show you what *he's* afraid of. But there must be horrors we don't even dream about."

One Hork said, "Dream?"

I grinned and left her to explain dreaming. And a shape like an overstreamlined turtle slid through the low-and-wide airlock.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Bazin!"

"Rick! I see you lack for customers. What's the topic?"

"Fear. What can I bring you?"

He wanted an array of consommés. While he joined the big table, I went for soup, a sparker for the Chirp, and dark beer for the Horka.

When I came back Sarah was saying, "H. P. Lovecraft tried to create the fear of something too big, too powerful, too different, too old. So did Lord Dunsany. Stephen Baxter went way further. He didn't try to scare you, he just reached further than most minds can stand."

Bazin asked, "Might you yourself grow too old?"

"Well, those old writers were mostly talking about the past. Wizards a thousand years old, or ten thousand—" The chirp was chittering laughter and Bazin's head had withdrawn into his shell, but she plowed on. "—Races older than humanity. Old enough that they'd know everything; they'd win any fight using techniques forgotten long ago. It's one way to tell a story."

"It's a sometime truth," Bazin said, "although one would need greater age than that! But what if you yourself were the old one? Ultimately there would be nothing of interest."

Sarah thought about that. "There'd be new things to learn."

The Chirpsithra said, "That is not sure at all. It grows more difficult to hold a civilization together as the universe expands. Have you learned yet that the expansion is accelerating? The galaxies fly apart faster and faster."

"Yes," she said.

"The galaxies themselves evaporate, some stars spinning out of the lens, some dropping into the black holes at the center. In ten billion years I see no possible way to connect cultures. The proton is unstable too. In some vast amount of time we'll have nothing but electrons and positrons all light years apart, and nothing interesting will happen ever again. Is this not something to inspire fear?"

Sarah laughed. "Would you call that 'existential fear'? It takes too long!"

Bazin poked his head out of his shell. "It frightens me," he said.

"Does it?"

"I cannot even think about it. I certainly do not intend to face it. Can you extrapolate me as the last cluster of protons in the universe? I must have some reassurance that I will not live to see all of this slow to a stop."

Is that why. . . ? I didn't ask, because Bazin was pulling into himself. Horn caps on his knees and skull blocked holes, locking his shell against intrusion. This was what he would look like at the end of the universe.

We next saw Bazin riding a kayak over a succession of waterfalls. Afterward he disappeared into a system of caves in the Mindanao Trench. He hasn't been seen since. We get occasional transmissions. ■

VISIT OUR WEBSITE
www.analogsf.com

Don't miss out on our lively forum, stimulating chats, controversial and informative articles, and classic stories.

Log on today!

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Get Me To the Job On Time

Ian Randal Strock

"Maybe it's what you'd do with the knowledge that determines whether or not you'll discover the secret of time travel."

"What?" I asked the old man.

"I know for a fact that time travel is possible. I knew the man who discovered it. And you'll never guess what he used his discovery for."

Well, I didn't believe that old man any more than you believe me, but we'd been waiting in that airport for four hours, so I humored him.

"All right, I'll bite," I said. "What did he use time travel for?"

"Wally didn't need to see the pyramids getting built, or sail with Columbus, or even watch JFK's assassination. What Wally wanted to do, more than anything, was get to work on time."

An introduction like that demands a story, so I sat down and let him tell me.

Wally didn't want fame [the old man said]. I think he would have been perfectly happy if no one but the payroll department knew his name. Did I mention we both worked in the same department?

Anyway, he loved his job. We were editors, and Wally simply loved being an editor; always got his work done on schedule, never made any mistakes, and there was no place he'd rather be.

But he had one big problem at work: Wally just could not get to work by 9:00 AM.

Some days it was a common excuse—train delays, doctor appointments, plumbing emergencies. And sometimes, the damnedest things happened to him—he got caught in hold-ups, subway hijackings, rat stampedes. Anything and everything, it seemed, conspired to keep Wally from getting to work on time.

And he could never understand it. On the one hand, his work was always done on time, and his lateness never affected anyone else—if I wanted to talk to Wally, I knew I had to wait 'til late morning. On the other hand, he tried his hardest to get in on time, and the few times he made it, he'd usually left the house three

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

hours early, and had been at his desk since 6:30. He just couldn't win.

I never believed in a determinist universe, but in Wally's case, I was starting to make an exception.

Discovering time travel, I think, was his calling. If he hadn't, the perversity of the Universe would have been proven beyond all doubt.

One Monday, Wally and I both walked in the door at 9:00 on the dot. He wasn't a few minutes late, nor screamingly early; he was precisely on time.

"Wally!" I said, "I'm stunned!"

"That's two of us," he said, and sat down to get to work.

I let the incident go, chalking it up to blind chance. I mean, if you're working in a place for a couple of years, the odds have to favor walking in the door at 9:00 AM at least once, right?

Well, the next morning, wouldn't you know it? He and I were in the same elevator, and on our floor at 9:00 on the tick.

"Okay Wally," I said. "Two days in a row you're on time. What gives? Are you leaving three hours early, and then waiting for me to get here on time?"

"No, no," he stammered. "Nothing like that. It's just . . . well . . . I think I've finally figured out how to get here on time."

"How'd you do it?" I asked.

"Can you keep a secret?" I nodded. "I've discovered the secret of time travel."

And he clammed up. Wouldn't say another word. I looked over at him every now and again throughout the day, and when he caught my eye, he'd wink and smile a little, so I wasn't sure if he'd been pulling my leg or not.

Come Friday, I couldn't stand it. I sidled up to Wally's desk about 9:30, and whispered to him, "Time travel, huh?"

"Mmm-hmm," he said.

"So what time did you leave home to get here at 9:00?"

"You won't believe me," he said.

"Try me."

"Today, I woke up at noon, watched the news, showered, ate breakfast about one this afternoon, took an uncrowded subway ride in to work, got to the lobby about quarter to two this afternoon, and then time-traveled back to 8:57 this morning. Then I stepped out from behind that big potted fern and joined the throng jostling for the elevators."

"Do you really expect me to believe that cockamamie story?" I asked him.

"No, not really. But it's the truth." And he went back to work.

I sat down at my desk, staring at the papers in front of me and not seeing them. Then I gave up. I dialed Wally's home phone number. It rang five times, and I was looking at Wally the whole time. On the sixth ring, a groggy Wally picked up; I knew his voice. I'm listening to Wally wake up on the phone while I'm watching him working at his desk not ten feet from me.

I hung up and went back to Wally's desk.

"Oh, yeah," he said, "Before I woke up at noon, the phone woke me sometime in the morning, but there was no one there."

I left the company a few years later, but by that time, I believed him. I think he really had found the secret to time travel.

I asked him about it at my going-away party. "If you've really discovered time travel, what are you going to do with it?"

"What do you mean, 'do with it'?" he asked. "I get to work on time. Isn't that enough?"

And the thing about Wally was, getting to work on time really was enough for him.

Then our flight was called. I boarded early to get to my seat in the back, while the old man waited for his row to be called. I figured I wouldn't see him again.

On the plane, however, he smiled at me as I walked to the back.

And we landed two hours early.■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The CERN LHC: A Black Hole Factory?

The Large Hadronic Collider (LHC), which is to be the world's highest energy particle accelerator, is currently being constructed at the CERN laboratory in Geneva, Switzerland. The machine was designed to be high enough in energy to produce a completely new type of particle, the Higgs boson, which is considered to be the missing puzzle-piece in the Standard Model of particle interactions. According to current theoretical thinking, it is the Higgs particle that gives mass to all the other particles, quarks, leptons, etc., in the current bestiary of fundamental particles.

However, there are new theoretical predictions that when the new accelerator goes into operation, the LHC's proton-proton collisions may also make something even more exotic: *black holes*. This column is about the possibility of black hole production at the LHC.

Physicists have found only four fundamental forces in our universe. These forces (with their relative strengths in parentheses) are: the strong force (1), the electromagnetic force (1/137), the weak force (10^{-6}), and the force of gravity (10^{-43}). Some current theories suggest that gravity is so much weaker than the other forces not because it is intrinsically weak, but because gravity is allowed to spread out its lines of force into several extra dimensions, while the other three forces are confined to the 3+1 dimensional "brane" that we perceive as our universe. The implication of this idea is that at small distances (less than a millimeter) and/or high energies (more than 1 TeV) gravity may become quite a strong force, as discussed in several previous Alternate View columns about extra dimensions for gravity (December 1999, April 2002, and August 2002). The implication of these ideas for the LHC is that the machine may be able to reach collision energies at which gravity becomes a very strong force and small black holes are produced in the collision.

Is this a disaster scenario, with the resulting black hole devouring first the LHC detector in which the collision occurs, then the surrounding French countryside and the city of Geneva, and finally the Earth itself? Fortunately, no. Black holes with masses around 1 TeV don't stay around long enough to devour anything. As Stephen Hawking taught us, they would be super-hot little objects that would dissipate all their energy very rapidly by emitting radiation and particles and wink out of existence. But that's getting ahead of the story. Let's continue with some questions and answers about black holes.

Q: What is a black hole?

A: It's an object that has acquired enough mass for its size that its accumulated mass is completely confined by gravity, so that the velocity of escape of any mass from its surface exceeds the speed of light. To put it another way, the gravitational force at its surface is so strong that the energy cost of moving a lump of mass from its surface to some distance away exceeds the mass-energy of the mass lump.

Q: Do black holes actually exist, or

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

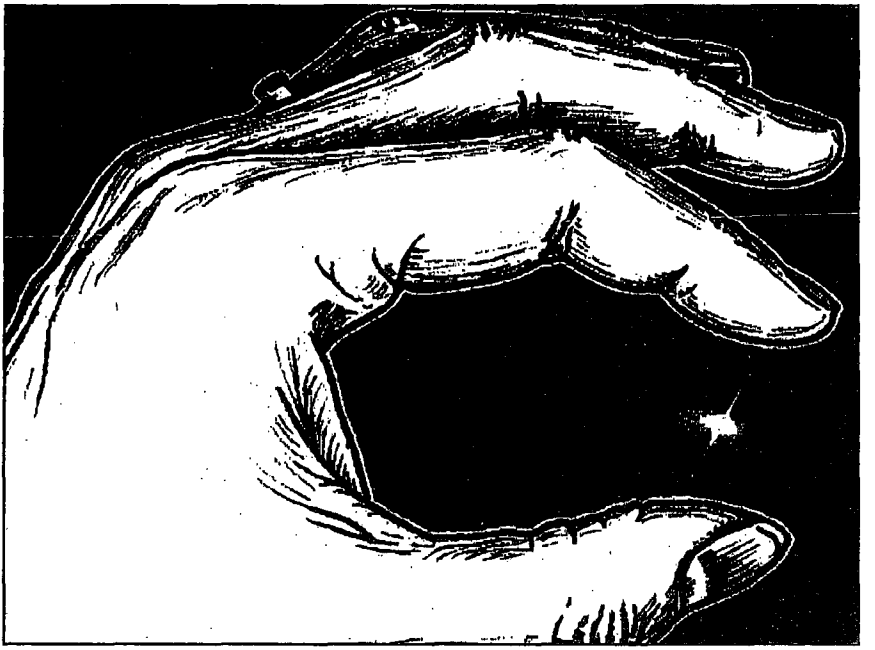


Illustration Wolf Read

are they some theoretical fantasy?

A: There is good astrophysical evidence for the existence of black holes from the energy-squandering behavior of quasars and active galactic nuclei, from x-rays emitted from certain binary star systems, and from the high velocities of stars near the center of our own galaxy, which is believed to have a large black hole at its center.

Q: How large can a black hole be?

A: There's no upper limit to the mass and size of a black hole. In a certain sense, our entire universe is a black hole, with us inside.

Q: How small can a black hole be?

A: The mass of a black hole can be no smaller than a Planck Mass, which is $(\mathbf{hc}/2\pi\mathbf{G})^{1/2}$, where **h** is Planck's constant, **c** is the speed of light, and **G** is Newton's gravitational constant. Since gravity is weak, **G**, which sets the scale of the strength of gravity, has a small value (6.67×10^{-11} N m^2/kg^2). This makes the Planck mass fairly large (22 micrograms, or in energy units, 1.22×10^{28} eV).

Q: In the Standard Model, could a minimum-size black hole be produced by an accelerator?

A: No. A minimum-size black hole should have a mass of about 22 micrograms, and an accelerator would need an energy of about 10^{16} TeV to produce it. That energy is many orders of magnitude higher than the few TeV available in the collisions of current accelerators like the FermiLab Tevatron, or accelerators under construction like the CERN LHC, or even accelerators in the planning stages like the NLC (see my column in the February 2002 issue of *Analog*).

Q: Are there ideas beyond the Standard Model that would allow production of a minimum-size black hole by an accelerator?

A: Yes. New ideas suggest that gravity becomes stronger at small distances because of the effects of extra dimensions used only by gravity. In this scenario, as the effective value of **G** grows larger, the Planck mass drops, and the energy required to produce black holes can drop

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

to 1 TeV, well within range of the LHC, but probably out of reach for the Tevatron. Thus, the LHC may turn out to be a "black hole factory," an accelerator that makes large quantities of minimum-size black holes.

Q: What would happen to such mini black holes?

A: As Stephen Hawking showed in the 1970s, a black hole behaves like a hot object with a certain surface temperature that depends on the curvature of its surface. A mini black hole like those that the LHC might produce would have a very small radius (around 2×10^{-19} m) and a correspondingly large temperature (about 1.5×10^{14} K or about 25 billion times hotter than the surface of the Sun). In energy units, this temperature is 80 GeV. At such a high surface temperature, the black hole would "evaporate" very rapidly into lighter particles: photons, electrons, and quarks, with energies ranging from 80 GeV down.

Q: If such mini black holes were produced, what would be seen by the LHC detectors?

A: First, if no black holes were produced, an LHC collision would make a relatively small number of high-energy particles that form into back-to-back "jets," or groups of high-energy particles going in the same direction. On the other hand, if a black hole was made, the particle count would increase dramatically, but the energy of each particle would be much smaller. Instead of making perhaps 100 particles with kinetic energies around 100 GeV or more, a collision event that made a black hole would make thousands of lower energy particles, including many electrons, positrons, and photons with energies around 10 GeV or less. Such a dramatic change in the character of an LHC proton-proton collision should be very obvious in the collision data, and should provide a "smoking gun" signal of the production of black holes.

Q: Could such collision-produced mini black holes be "nurtured," prevented from decaying, and made larger?

A: Perhaps, but it's not obvious how that could be done. The black hole evaporation could only be suppressed by surrounding it with a medium that was even hotter than it was, so that it absorbed more radiation than it emitted. No such medium could be sustained. Even the interior of the Sun would be a billion times too cool to do the job. However, if you could immerse the black hole in such a medium, it would grow in mass and radius and cool in temperature as it absorbed mass-energy from the medium. Eventually, it might be cooled enough that it could be removed from the hot environment and become relatively stable.

Q: Would a stable black hole have any uses?

A: Indeed it would. It would be an excellent mass-detector and a wonderful energy source. It could be fed mass, and some fraction of the mass-energy ($E=mc^2$) could be recovered and used. However, as a number of SF writers have pointed out, a "tame" black hole would also represent a certain hazard, since if it were accidentally dropped, it would probably fall to the center of the Earth and devour the planet from the inside.

That's the LHC black hole scenario. At some energy scale, perhaps as low as 1 TeV, gravity may become a strong force and accelerators with enough energy may become "factories" producing mini black holes in great numbers. The black holes will evaporate away rapidly, in the process radically changing the behavior of the collisions.

Are there any problems with this theoretical scenario? I'm afraid so. The problems revolve around issues of time-reversal invariance and the arrow-of-time problem. In the everyday world, we have no difficulty in distinguishing one direction of time from the other. A movie showing a dropped egg hitting

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the floor or a car crash looks very strange and unphysical if the film is run backwards. But on the microscopic scale, there is supposed to be no time preference. A movie of the interaction of fundamental particles is expected to represent anticipated behavior, even if the movie is running backwards. This is called "time-reversal invariance" and it is an important symmetry principle of the microscopic world.

But a mini black hole would strongly violate this symmetry. A movie of a super-hot black hole emitting particles has a distinct time direction and would look strange and unexpected if the movie were run backwards. This means that particle collisions at the LHC should show dramatic violations of time reversal invariance. Moreover, since right-vs.-left handedness and matter-vs.-antimatter asymmetries cannot be expected to compensate, the more fundamental TCP symmetry principle (time-reversal plus matter-antimatter interchange plus reversal of spatial directions) will also be violated. Even at lower collision energies at accelerators like the FermiLab Tevatron, where there may not be enough collision energy to produce free black holes, sub-threshold virtual process involving black holes might be expected to produce time reversal and TCP symmetry violations (but we note that none have been observed).

Is there any way around this problem that would permit mini black hole production at the LHC? The physics literature is silent on this issue because the time-reversal invariance aspects of black hole production in particle collisions have not yet been analyzed or discussed in detail. However, let me suggest a possible fix.

In general relativity, in addition to the solution to Einstein's equations that we call a black hole, there is another solution called a "white hole." It is, in effect, the time-reverse of a black hole—a black hole running backwards. In a black hole, matter falls in to become completely bound with no possibility of escape, while in a white hole, matter falls out to escape completely with no possibility of binding. If matter runs down the drain of a black hole, it emerges from the fountain of a white hole. In observational astronomy, no evidence for white holes has ever been found, despite several searches. Moreover, there are arguments that if cosmological white holes were ever produced, they would have vanished early in the Big Bang.

However, the time-reversal problem of the above scenario could be cured if the LHC produced black holes and white holes in pairs, with most of the particles emerging from the white hole feeding into the black hole. I'm not sure how such a system would evolve, but as in the black hole scenario above, it would probably evaporate into lighter particles and be observed primarily as a change in the character of the spectrum of particles emerging from an LHC collision.

The test of these ideas will come in a few years. When the LHC goes into operation, we may discover the Higgs boson or we may find that indeed gravity becomes a strong force. Or we may discover other things that no one has even predicted. Watch this column for further developments. ■

References:

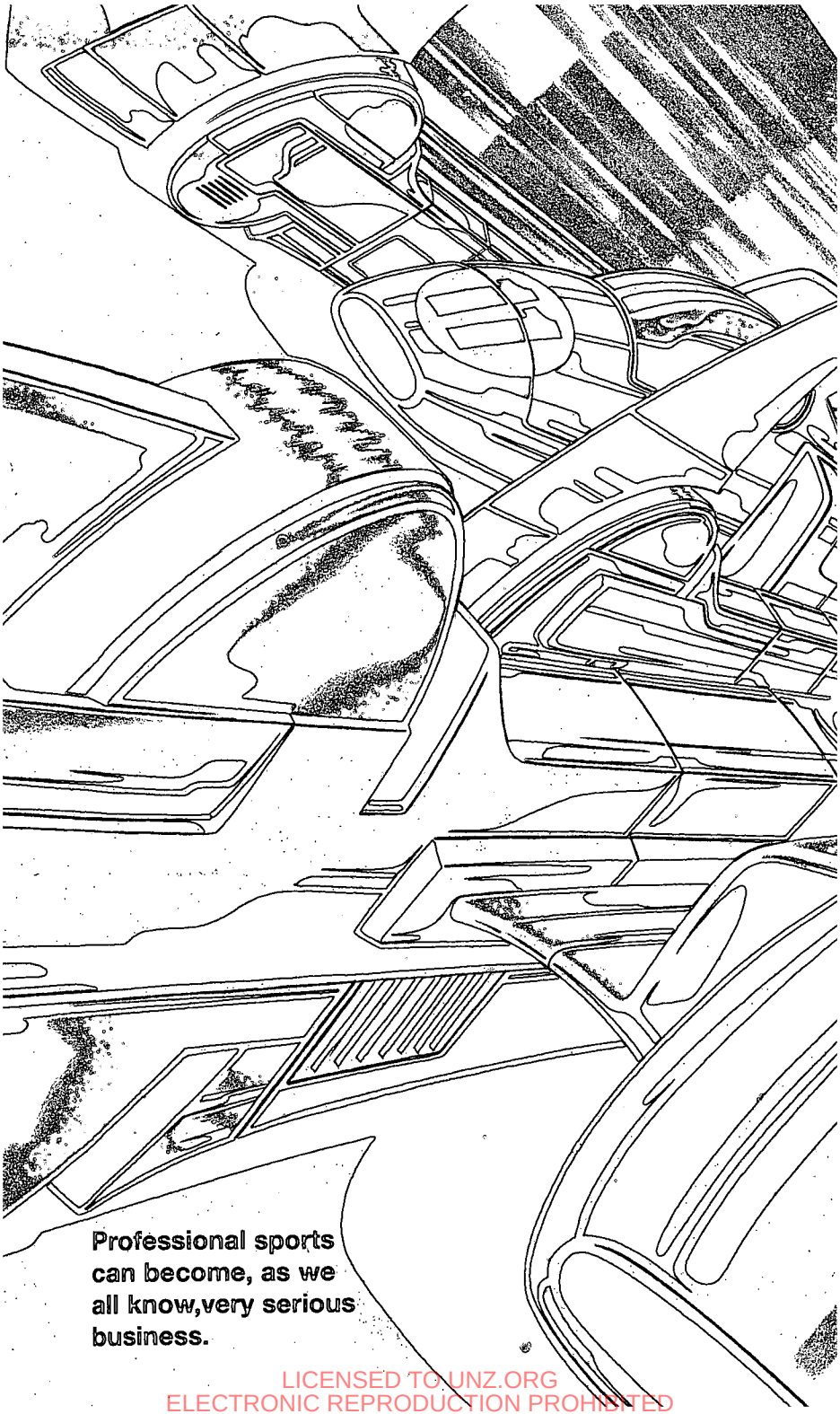
Black Hole Production at the LHC

"Black Holes at the LHC," S. Dimopoulos and G. Landsberg, Phys. Rev. Letters *87* (2001) 161602, preprint hep-ph/0106295 available at http://arxiv.org

"Black Hole Chromosphere at the LHC," L. Anchordoqui and H.Goldberg, preprint hep-ph/0209337 available at http://arxiv.org.

AV Columns Online: Electronic reprints of over 100 "The Alternate View" columns by John G. Cramer, previously published in *Analog*, are available on-line at: http://www.npl.washington.edu/av.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED



Professional sports can become, as we all know,very serious business.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The Day the Track Stood Still

John C. Bodin
and Ron Collins

Illustration by John Allemand

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Indy's like no other racetrack—four turns, all left-handers on nine-degree banks, each with its own little personality disorder. Turn one is narrowest and fastest. The grandstands tower above it, lending a claustrophobic aura that makes racing feel like you're pissing yourself back into a toothpaste tube at 481.532 miles an hour. Turns one and three follow the front and back straights, so you brake like a sumbitch there or the safety crews get to scrub skin off concrete. You can accelerate through turns two and four, but one and three take your respect one way or the other.

Yes, Indy is like no other track.

But then Babs is like no other car. Long and sleek with a flash-molded titanium body, a Banshee 250 q-drive power plant, an effective IQ of 245, and a drive-by-wire neural net that sucks beta-blockers like sugar pills, Babs just begs to be driven hard.

"Drive me hard," she purred as I connected up and strapped into the cockpit. "We've only got four minutes, 6.37 seconds to get to the grid, and I need a warm-up lap." The skin around my neck grew warm as she ran the seratonin check. I suddenly smelled fuel and rubber and the tantalizing aroma of cool asphalt warming in the late morning sun. Most cars on the circuit love to run, but Babs takes it to a totally different level.

I tried not to think about what was at stake. The pressure was bad enough without telling her this was for all the marbles: if we lost this Indy 500, she was gone. *Sayonara muchacha. Hasta la bye-bye*, and good night, Babs. That's the way it is when you race the B'arada. They put up a piece of tech, you put up a piece of tech. Winner takes all, Indy 500 style.

Turns out Babs was the only thing humanity had left that the B'arada wanted.

I flipped the ignition, and a quarter-million horses rumbled from the back. Babs hit a couple switches that doctors from around the globe would give their Hippocratic oath to know about, and the endorphin-meter inside my brain snapped to attention.

"Hear about the B'arada swap in the number eleven car?" Sparky screamed from my left earpiece.

"What?"

"Just a Foyt clone. Not a big deal."

Sparky's a helluva simchanic, but sometimes his sense of reality isn't torqued to spec, if you know what I mean.

"Not a big deal? Four minutes till race time and you're just now telling me about a driver swap? Whatthahellduya mean, not a big deal?"

"Put your rockets on simmer, man. There's a bunch of clones running—Mears, Fittipaldi, every Unser and Andretti in the catalog, even an old Parnelli Jones from what I heard. Don't worry, though. The Foyt is probably a late model. No competition."

"I'm glad *you're* not a clone, Buddy," Babs murmured. "They're so *cold* and *unfeeling*." The entire chassis vibrated with harmonics I'm certain had never been invented until then. "I need a warm-up lap, Buddy. Ready to lay a little rubber and heat up the tires?"

"Hold your quarks a sec, okay, babe?"

Her proton splitter roared displeasure, but I needed time to think about this.

Number eleven. Latest design from Lockheed-Reynard, ion-plasma drive with the latest fusion intercooler technology. It was outside-front-row fast, and that was with a B'arada behind the console. A Foyt clone, even a late '80s model, would beat the crap out of a B'arada.

Damn.

If there's anything I'm good at (besides driving Babs), it's sniffing out rats, and this one suddenly reeked particularly rodentile. We were on the pole, though—fastest qualifier and all that. So bring 'em on, I thought.

"I'm not waiting any longer," Babs said.

The engine screeched like the ban-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

shee it was so-aptly named for. The intake manifold sucked matter-antimatter pairs from the quantum foam and fed them into a pair of supercooled synchrocyclotron coils Lawrence would have been proud of, which in turn spun up the gravity downforce generator.

Next thing I knew we were scrubbing rubber at the Brickyard. If there's anything more uninhibited than an overrevved 500-mile-an-hour hot rod with 1800 megawatts of power at her disposal, I've yet to meet her. The gravity-gen downforce system sucked enough power to run Chicago for a year as we dove into turn one, picked it up around two, and hurtled down the backstretch. Babs moaned with ecstasy as I hit the brakes in turn three. Friction melted my mind. Everything from the tips of my toes to the ends of my hair tingled with electricity. Babs has this habit, you see, of getting a little, uh, enthusiastic in the early laps, and being netted means I've resorted to wearing rubber knickers under my g-suit.

Let's just say it's never too hard getting corporate sponsorship to ride shotgun in neural-link position, if you get my drift.

But I'm a professional and I had a job to do.

I kept us on course and feathered the throttle through the short chute. Babs burned mass in turn four and we were back at the bricks in what the pylon said was an unofficial track record. The crowd went white noise.

Yes, Babs is not your average car. She could, of course, run code that would do all the driving, but the Galactic Racing League quickly found that no one paid to watch a bunch of nuts and bolts whiz around a track like grown-up slot cars. Losing a couple advertising contracts was all it took for them to institute the man-in-the-loop rule that ensures jobs for lead-footed neural jocks like me. Every now and again, I kid her about being an overgrown riding mechanic, but it never seems to bother her any.

"That was beautiful, babe," I said with a grin.

"Thanks," she purred in reply.

A car flashed by us. The pylon lights flickered. Our lucky number thirteen moved down to the second slot.

I didn't have to guess twice to know what would be there now.

Number eleven.

"Are you okay?" Babs said into my cerebral cortex.

We were sitting in the pits, waiting to go back to the track for the start of the race. My features must have darkened. The smile slipped from Sparky's face. I was the one treated to Mr. Toad's Wild Ride the day we faced the Foyt Mk V in his Intel-Penske, but Sparky had been there, too. He remembered same as me.

"Is it Lucy?" he said.

"Who's Lucy?" Babs asked, suddenly awake.

I just stared at the number eleven car. She was different. No doubt about it. They had changed her aerodynamics, wiped her memory banks, reprogrammed her personality center, and painted her up like a Market Street hussy. But there was no doubt it was her under that Lockheed-Reynard facade. Given everything I could see that they had tinkered with, I glumly wondered what the B'arada had done that I *couldn't* see.

"Wasn't your fault, Buddy," Sparky said. "And it's just an A.J. clone. It's not like it's even *the* A.J. clone. Those things don't last more than a race or two. Besides," he continued, his voice lower, "it was a fluke, Buddy—just a mistake. It's in the past, and you've got a race to win."

"Absolutely," I said. "Let's do it." I didn't feel any better, but Sparky was right. It was time to pick my chin off the floor and get to work.

"I asked you a question," Babs said in a tone cold enough to pass for a naked shoulder in Siberia.

"What question was that?"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Who's Lucy?"

I did my best imitation of a guy shuffling his feet. "Uh . . . it's a long story," I said. "And we've got only two minutes to get to the grid."

"We're not going anywhere until I get a straight answer."

Dammit, I thought in an unguarded moment. I should have told her before.

"Told me what?"

This is the biggest problem with neural linkage: It takes a lot of concentration to keep a thought to yourself. Babs and I have been together a long time. I was lucky to hold it this long. I looked at the system clock, feeling her virtual foot tapping in the background. This had better be fast and convincing, or we weren't going to be doing any racing today.

"All right. You win."

"That's better." Her collider manifold settled into a gentle rattle.

"Lucy was my first big-time ride, my first shot at the circuit. She was an early Lockheed-Reynard—state of the art and very, very fast. We were unbeatable for a couple years."

"Yeah," Sparky chimed in, "all the way until Indy in '34."

"You had a girl before me?"

"Give me a break, babe. I was a two-time champion before we paired up. You knew that."

She was quiet for a nano.

"So. What happened?"

I sighed, watching the seconds slip away.

"Like I said, we were fast. But what I didn't say is that we were fast because Sparky was the first electron monkey to perfect the neural link."

"Ah. You used B'arada technology against them," Babs said with admiration in her voice.

"More or less," Sparky said proudly.

"Pretty slick."

"Very slick," I agreed. "The B'arada were baffled at first. To make things even better, Sparky's modifications messed up B'arada physiology when they tried to use them."

"Boy howdy were they ever pissed," Sparky hooted.

"Nobody likes to lose," Babs replied.

"B'arada like it less than most," I said.

"So you pissed them off and they took you and Lucy out by planting you in the wall with some kamikaze move?" Babs guessed.

"I wish that were the case. But what they did was far worse than that."

"What could be worse than that?"

"Ever wonder how clones came to be a part of racing in the first place?" Sparky asked.

Her gauges brightened as she thought. "The B'arada used them so they could exploit Sparky's interface?"

"Bingo!" Sparky said.

"Okay. So, what's the big deal? Buddy's been beating clones for years."

"I'm a better driver now than I was then, and they were sneaky about it. They didn't reveal their first clones until *after* they arranged a less-than-friendly wager," I said bitterly.

"A wager?"

"You know how the B'arada love to gamble."

"Well, sure."

"They let Lucy and me rack up the wins while they laid a line of ever-increasing bets. Then at Indy they brought out the big kahuna—interstellar hyperdrive technology."

There was silence for a moment, then Babs asked, "What did you have to put up in return?"

"Lucy," I replied.

"You bet your *girlfriend*?"

"We thought we couldn't lose," Sparky said, his head hanging like a whupped hound-dog's.

"The first A.J. clone was an early '60s vintage. It beat us easy."

"I can't believe you lost your girlfriend in a bet."

My hesitation was, perhaps, just a moment too long.

Sparky cleared his throat.

"Don't tell me," Babs said. "This time it's my proverbial butt on the line?"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

I couldn't look her in the console. "You don't understand, Babs. Hyperdrive technology will advance humankind by centuries, and it's not like I had any real choice in the matter. The president of the United Earth herself made the deal."

Silence hung heavy in the air. The countdown to the parade lap drew toward zero. Suddenly Babs's power plant spun up.

"You're gonna owe me big time for this, Buddy."

"Huh?" was all I could muster.

"You've beaten A.J. clones before, right?"

"Yeah."

Her tires squealed, and a cloud of dust rose in the air behind us.

"I don't want to spend the rest of my days in a B'arada dustbin, so get your ass out of the dumps and drive me hard."

The Jim Nabors clone sang the song. The Golden Girl threw the baton. Mary George IV said the famous line "Ladies, gentlemen, and all you other things . . . start your engines."

The green flag fell and Babs screamed down the front stretch and into turn one, the A.J. clone fading in her rear-vid mirror.

"So that's Lucy, eh?" Babs said as she flipped a neuro-transmitter, and a gazillion sensations raced through my brain. "Doesn't seem so hot to me."

Let me tell you, there can't be anything more frightening than turning megarevs while strapped into a suicidal lover who's just learned you've risked selling her into slavery on a bet that might let humankind do the Star Trek boogie. Her first lap was a new track record. Her second was faster. Her third faster still.

You might say she was a little pissed.

I just let her run and tried to concentrate on the track. I experimented with getting on the brakes a little later in turn one and hitting the throttle quicker on the way into the short chute. I guided Babs into the high line, and pulled her away from the wall down the straights. Ten laps into it, we were working together like Rogers and Astaire. It was almost enough to take my mind off the number eleven that suddenly seemed plastered to the rear-vid.

"Don't worry," Babs moaned as we swept through turns three and four for another lap.

I gave a tension-filled laugh.

They say worry is a stainless steel rat that gnaws through neural interfaces to short-circuit your persistence by defecating on your survival instinct. But I know better. For me, worry is a car and a clone and a set of circumstances from my past. Worry is an A.J. strapped into a Lockheed-Reynard lurking in my mirrors and waiting for me to make a mistake.

Don't worry, she says?

What the hell did Babs know about worrying?

We led for a while, then backed off while lesser drivers tried to win the race before it was halfway over. A yellow came out while they scraped a Rutherford off the wall. A three-car inferno erupted on the restart, causing the B'arada contingent to file a claim that the Galactic Racing League commission ignored or lost or otherwise failed to rule upon.

Other than that, the first 190 laps were uneventful.

We were running a strong second with ten laps to go—right behind a B'arada, believe it or not. Lucy and the A.J. clone were nearby, but hadn't shown the ability to take us all day. Babs was writhing in ecstasy with every turn. I was burning with that fever that comes when your butt's three inches off the pavement and you're traveling at something approaching the speed of sound. We were, as they say, in the groove.

The B'arada was dead meat and everyone knew it.

We passed the start/finish line, and

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the B'arada's machine slowed to enter turn one. I waited on the brakes as long as I could, and we blew past him. The crowd cheered and shot to their feet to get a good look at the massive wreck that would undoubtedly occur when we hit the wall. I jammed the brakes. Babs responded with split-second timing, cutting in for the turn and taking advantage of the oversteer that had snuck into our setup after the last pit stop.

I kicked the proton gun and pulled on the antimatter coil like it had never been tapped before. I would have blacked out if it weren't for my g-suit and Babs's insistent presence echoing through my cranium.

We rocketed through turn one and thundered down the short chute with less than ten laps between us and victory. I glanced in the rear-vid and was surprised to see a car there.

Number eleven.

Damn.

Apparently Babs and I hadn't been the only ones holding back. Sweat broke out all over my body. "Come on, babe. Time to hit the afterburners." I rolled a finger over the gearshift and dropped down a gear. She seemed to jump out of her skin—as fresh as she had been at the beginning of the day. Amazing. I had never seen a car like her before, and probably never would again.

Number eleven grew smaller in the mirror.

"You weren't worried, were you?" Babs asked in her smokiest voice. A shiver went down my spine. "We're the unbeatable ones today, lover."

By lap 199, the margin was comfortable.

It was going to take more than an A.J. model and an old flame to stop us today.

Lady luck is a fickle wench, though.

Had I been listening to the radio better, perhaps I would have been able to avoid the situation. But as fate would have it, I missed the announcer as he said, "And *another* Mario is slowing down."

We barreled into turn one and there it was—a Mario unit loafing along at 200 miles an hour, smack in the middle of the racing line. Braking would have been disastrous, so I fired off a quick left-right-left. Babs swerved toward the unforgiving wall. Her tail slewed, and she grunted as the right rear brushed the concrete. A 495-mile-an-hour rugburn brought tears to my eyes.

The maneuver was successful, though, and we flashed past the slowing Mario. I allowed myself to resume breathing about halfway through turn two.

A red blur flashed past us. My heart skipped a beat. Number eleven—Lucy and the A.J. clone—raced ahead. Babs screamed from all synch-cycs and poured it on, but we had scrubbed too much speed in the Mario event. The A.J. clone's lead stretched to several car lengths by turn three.

Lucy may have been my first great car, but I realized at that precise moment that it was Babs who was my real soulmate. Tears welled in my eyes as I thought of losing her. What had I been thinking? What was I going to do without her?

"Buck up, lover," Babs said through gritted circuits. "T'ain't over till it's over."

I owed her. We weren't going to win, but I owed her the nobility of this effort if nothing else, and I was determined that Babs would at least know what true love meant before she was carted away to languish in some dirty old B'arada tech lab. So I screwed on my determination, cranked up my resolve, and brought her down under the racing line. Her quantum foam drive roared and scooped particles through turn three. She raced out of the short chute and into four. My view narrowed and darkened as acceleration brought on tunnel vision.

The distance between us shrank. The A.J. clone saw us looming in his rear-vid and ducked even lower on the apron, all

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

four wheels under the line. We were two lengths behind coming out of turn four.

It was a drag race to the end.

The A.J. pushed Lucy harder than ever. My synapses commanded the particle accelerator through the floorboard, and Babs screamed like a rocket. We were gaining. Inch by excruciating inch, we were hauling them in.

But I saw clearly that we didn't have enough track left.

We were giving it all we could, but we were going to come up short. I pounded the console. "Dammit!"

Babs's voice came from all directions at once. "Hang tight, Buddy." She swung out from behind the A.J. and into that massive wall of air.

Then my stomach turned a loop, my ears crackled, and I swear I saw stars. The finish line receded like I was looking through the wrong end of the binoculars. Someone dropped a concrete block on my chest, and my view became a pinpoint of light.

Did I see a checkered flag waving?

Number eleven crossed the finish line . . . racing *toward* us? Yes. That's what I saw.

We were sitting at the entrance to turn one, facing backward. Somehow we had come to rest *beyond* the finish line.

"What the . . . ?"

"We won, lover," Babs said in a dreamy, faraway voice as her engines wound down to a steady purr.

The rest of that afternoon happened too fast. The victory lap, Sparky pounding me on the back as I accepted the traditional bottle of milk, hefting the Borg-Warner trophy in the Winner's Circle, the interviews, the phone call from the president—it all disappeared in a blur. It wasn't until later that night in the quiet of the garage area that Babs and I got a chance to talk.

"I don't understand what happened today," I said after linking into her net.

"We won."

"You know what I mean."

"You really didn't know that hyperdrive units are just tweaks of the same technology that went into my engines?"

"No, uh, I didn't. What does that mean?"

"Hyperdrive. Think about it. I came up with it just before the race started."

She spread a little seratonin enhancer across my wet-net and my vision ran clear.

"We created a temporal displacement?" I asked in disbelief.

"No," Babs chided. "*I* created a temporal displacement. You just sat there trying not to vomit."

I swallowed hard. "I don't think the rules committee is going to like this."

"Maybe. But I don't think the B'arada are going to protest."

"Why not?"

"You've been too busy playing hero to the sponsors to hear the news, eh? When they lost, the B'arada had to fess up because they couldn't pay the bill. They never had hyperdrive capability in the first place."

"I don't understand."

"They were betting tender they didn't have."

"They can't do that."

"They defended themselves by saying they didn't think they could lose."

I was suddenly embarrassed. Knowing that Babs could feel my embarrassment made it worse. Damned neural interface. "I'm sorry," I said. "I shouldn't have allowed them to bet you."

"That's all right, lover. You're forgiven."

I felt better.

"Don't think that means you're off the hook, though."

"How can I make it up to you?" I said, not certain I was going to like where this was going.

"I put a call in to the president and offered her a deal," Babs replied. "Hyperdrive technology for unlimited access to every racetrack in the world."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Cool."

"Only one catch."

"Yes?"

"I don't pay up until you agree to a lifetime contract."

I grinned. "The first man/machine marriage?"

"You got it, lover. I was thinking Monte Carlo for the honeymoon, then maybe Sebring. I hear they do some endurance racing there."

"It's a deal," I said. I was more than a little concerned with my ability to keep up with her for twenty-four hours of rugged road racing, but that was an issue for another time. The connection between man and machine tingled in every nerve I had and a few that I'm certain hadn't existed until now.

"I still don't understand, though. If you knew you could do the hyper-thing from the very beginning, why did you even bother to run the race?"

"Oh, Buddy," Babs said, with a hushed breath catching in her neural circuitry. "It's all the laps in the middle that make a race worth winning."■

Many a man thinks he is buying pleasure, when he is really selling himself a slave to it.

—Benjamin Franklin

Men are never so likely to settle a question rightly as when they discuss it freely.

—Thomas Babington Macaulay

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

4 MYSTERY MAGAZINES

just $5.95!

When it comes to knock-'em-dead detection, nobody outdoes ***Ellery Queen's Mystery Magazine.***

To introduce you to the award-winning fiction of ***Ellery Queen's Mystery Magazine,*** we'd like to send you a special value pack of four favorite issues for just $5.95 plus shipping.

Special introductory offer.

To get your value pack, fill out the coupon below and mail it to us with your payment today.

PENNY MARKETING

Dept. SM-100, 6 Prowitt Street, Norwalk, CT 06855-1220

☑ **YES!** Please send me my **Ellery Queen's Mystery Magazine Value Pack.** I get 4 back issues for just $5.95 plus $2 shipping and handling ($7.95 per pack, U.S. funds). My satisfaction is fully guaranteed! My payment of $_____ is enclosed. (EQPK04)

Name: _____
(Please print)

Address: _____

City: _____

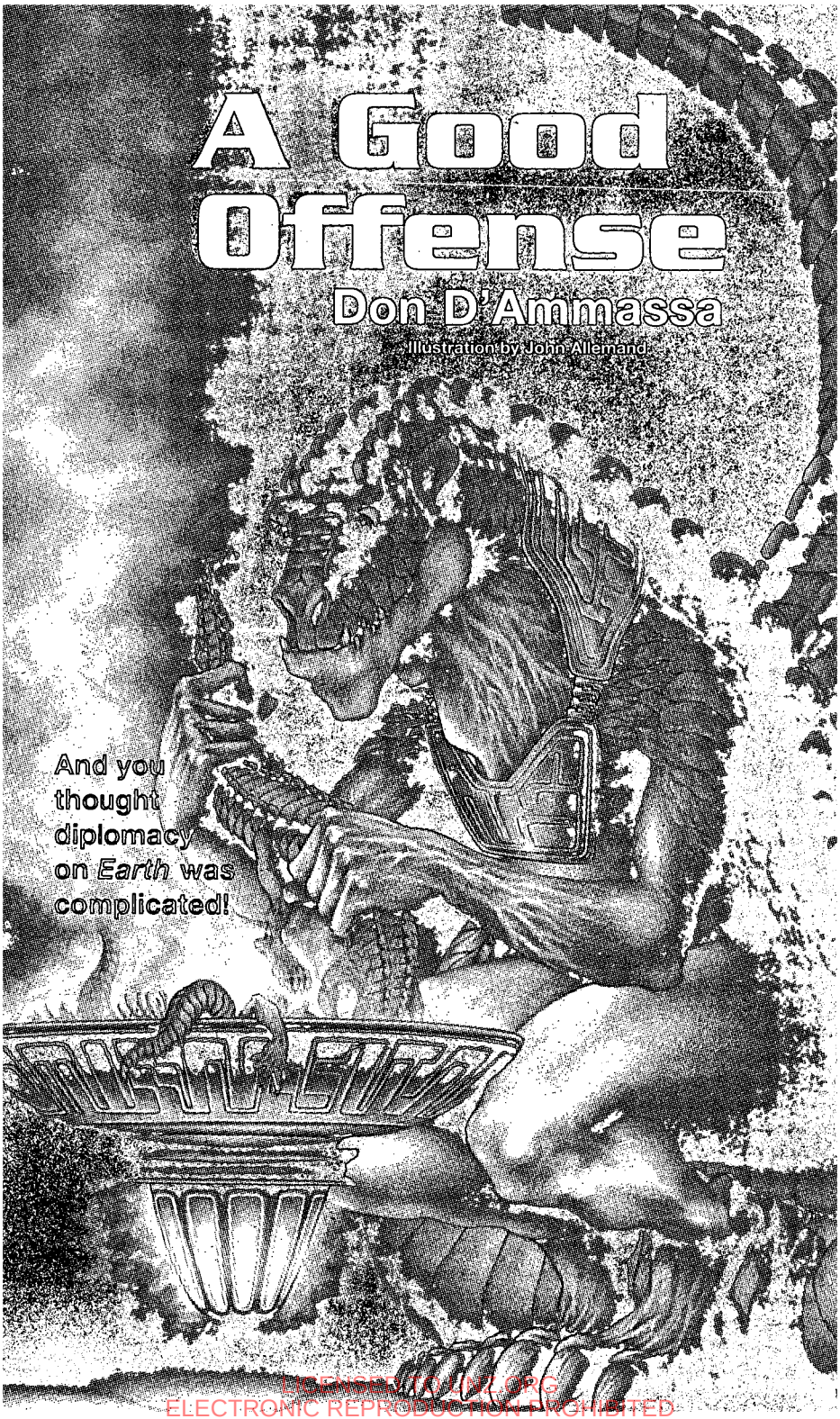
State: _____ **ZIP:** _____

Please make checks payable to Penny Marketing. Allow 8 weeks for delivery. Magazines are back issues shipped together in one package. To keep prices low we cannot make custom orders. Add $4 additional postage for delivery outside the U.S.A. Offer expires 6/30/04. 53C-NHQVL2

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

A Good Offense

Don D'Ammassa



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The Pulagi Ambassador and his life partner were barbecuing their children on the patio again.

Nathan Shaver tapped the privacy toggle angrily, turned away from the window even before it opaqued. A large part of his training was specifically designed to help him deal with xenocultural differences, and on a purely intellectual level he realized that the Pulagi were acting from biological necessity rather than cruelty. A functional Pulagi female dropped three or four litters of young every terrestrial year, and if the species hadn't adopted drastic infanticidal practices millennia earlier, they would have bred themselves into chaos long before they achieved any real civilization.

"What's up?" Adele was standing in the archway, still wearing her nightgown, obviously only half awake.

"It's nothing. Go back to sleep. You were tossing and turning all night."

"Yeah, I was restless." She covered a yawn with the back of one hand. "They're doing it again, aren't they? She was about due."

Nathan nodded, trying to keep his expression neutral. Shortly after they'd moved to the diplomatic compound here in Florida, Adele had been sitting out in the yard when Ambassador Salanga's predecessor had carried six of their young out onto the patio, where he methodically chopped them to bits with an ornamental knife.

"I think I'll go into the city and do some shopping." Her sleepiness had magically disappeared. Nathan could understand her feelings. Even with his training and psychological conditioning, he found the population control practices of the Pulagi emotionally unsettling. It wasn't so much the fact that they killed most of their young, but that they expressed no regret afterwards.

During the ordinary course of his duties, Nathan rarely interacted with the Ambassador. The arrival of the Pulagi on Earth three decades earlier had traumatized human society, but the turmoil had passed once it became obvious that life was going to continue pretty much as it had before. Although not truly reptilian, the Pulagi's superficial resemblance to alligators made their choice of Florida as the location for their embassy seem logical and appropriate.

Nathan usually paged a skittercab to take him to the embassy annex, but today he walked to work, hoping the physical exertion would help to burn off the tension he was feeling. He arrived at the Center for Intercultural Studies early and took the liftube down to the basement cafeteria for some coffee.

One of the few Pulagi he knew by sight, a mid-level official named Sittakaper, was already there, sitting alone in one corner chewing on the corpse of one of the lower animals the Pulagi bred in the basement of their embassy to provide a source of fresh meat. Humans and Pulagians could actually digest most of each other's food—although neither species would remain healthy on an exclusively alien diet—but few humans cared for the pungent cuisine of their visitors. Nathan wasn't really in the mood to deal with the intricacies of interspecies communication, but it would have been a decided insult to ignore the other being's presence.

"May your day be more terrible than yesterday," he said ritually, his mind quickly settling into its conditioned pattern.

"It would be an appropriately dismaying beginning if you were to join me." The Pulagi males were in general taller and bulkier than humans, but Sittakaper was a female and the smallest adult of their species Nathan had ever met, a mere two meters.

Nathan took a seat directly opposite the alien, wondering if he could avoid a prolonged conversation. The Pulagi dealt with life in a very indirect fashion, and despite a highly advanced technology, their interpersonal relations were dominated by what seemed to be a very simple superstition. Just as actors ad-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

vised each other to "break a leg" when they actually meant the opposite, the Pulagi phrased most of their intercourse negatively. Most, but not all, and the challenge to humanity was to develop an ability to determine which mode was appropriate from situation to situation. Thirty years of contact had provided more questions than answers.

"How is your refreshment today?" The Pulagi could almost speak human languages recognizably, but they still needed a vocoder to be understood clearly.

Nathan concentrated. Was this a gambit of Accelerated Denigration, in which case he should suggest that the Pulagi's choice of foods was disgraceful, or had they achieved a Plateau of Mellow Balance, which allowed conversation to continue more or less in human fashion? While he hesitated, Sittakaper filled the vacuum.

"I regret to advise you that His Eminence has indicated his desire to meet with you personally today."

"The Ambassador?" That was indeed unusual. Although they were neighbors and occasionally interacted outside of the compound, they rarely met in an official capacity. The Pulagi differentiated so distinctly between an individual's private and professional lives, it was almost as if they were two separate personalities. One theory held that their entire culture was schizophrenic, that the Pulagi compartmentalized different aspects of their personalities so effectively that they accommodated them without consciously choosing to do so. If that were the case, it might explain how they were able to express deep devotion to their surviving offspring, but feel no regret at all about the necessity of sacrificing the others.

"Indeed, I believe a request for your presence has already been transmitted." So they were at Mellow Balance. That simplified things.

"What assistance could someone in my inferior position provide to His Eminence?"

"Almost certainly none worth mentioning." In a human, it would have been rude, but it was quite obviously a Negative Closure, indicating Sittakaper had no further knowledge.

"Or too important to be trusted to one of your stature." Nathan was confident that this was the right response, that he had closed the loop, but he still felt as though he was delivering an insult. Sittakaper turned her attention back to her mildly disgusting snack and Nathan quickly finished his coffee and left the cafeteria.

As predicted, there was a message waiting for him. Ambassador Salanga requested his presence in Meeting Room Four at two o'clock local time.

Nathan spent the morning working halfheartedly on refinements to the dictionary of idiom that was his primary responsibility. Curiosity, even mild anxiety, interfered with his concentration. As far as he knew, he'd done nothing that merited the attention of the Ambassador.

He deliberately arrived for the meeting ten minutes late, just enough to allow the Ambassador to make a critical remark about his manners. This would establish their relative status at the outset and save time, and the Pulagi diplomat would be flattered that Nathan had taken such care to anticipate the requirements of decorum.

"I cannot imagine any sufficient reason for this disruption of my daily schedule," he replied after accepting the ritual admonishment.

"Which fact illustrates the paucity of your imagination, Nathanshaver." The Pulagi seemed incapable of understanding how a single individual could have multiple names.

Nathan took a chair without being offered one. To have waited for an invitation would have been a grave breach of manners. Had they satisfied protocol now or was an additional exchange required first? Salanga had used his name, which implied closure, but it seemed too abrupt. Cautiously, he took several seconds to settle into the chair, hoping for a clue.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"One of the more irksome duties of my posting to your backward world is the requirement that I review the progress of each function of our mission." Salanga sank back into the concave receptacle that passed for chairs among his people, his tail curled under his thighs. His words seemed to imply Accelerated Denigration, but his posture was too relaxed. That might have meant Haughty Insolence, but since the Ambassador outranked Nathan, it couldn't be. Veiled Contempt would have required stronger language, so this was probably Sustained Indifference, to which the proper response was Sarcastic Disdain.

"I am certain your staff responds properly to your unnecessary interference." He wasn't sure that he'd struck the proper note, but it was hard to find the right balance in this mode.

"Their incompetence is at acceptable levels." Salanga's phrasing reassured him. It was an obvious invitation to move to Mellow Balance.

"Has the communications office been less troublesome than usual?"

"Their progress has been nearly adequate." There was a short awkward pause that Nathan didn't dare try to fill. "My staff has indicated that your manners are occasionally tolerable and I wished to confirm this personally."

This was unusually high praise and Nathan almost lost his head and thanked Salanga. "Perhaps your staff has been less observant than they should be."

"No doubt. Nevertheless, it is necessary that I speak to you about an impending visitor from my government."

"Someone of no importance, I assume."

"None at all, but it will be necessary to accommodate his requirements nonetheless."

It took a while before Nathan extracted the entire story. The Pulagi didn't have a simple hierarchical command structure, so it was difficult to estimate the authority of Frelleger, the VIP in transit. In some of his duties, he was clearly Salanga's superior, but in others he appeared to be a subordinate. His immediate purpose was the issue, however, because it appeared he was coming to Earth to determine whether or not it was wise to maintain contact with the human race.

"Details are being forwarded to your superiors even as we speak, but I think it would be best if you personally saw to his discomfort." Salanga had wavered back and forth from Mellow Balance to Casual Exchange, the latter mode so unusual that Nathan had trouble keeping in step.

"I am sure I will be able to tolerate his presence as long as is necessary."

"In that case, he will certainly leave us at the earliest possible opportunity."

That sounded like Negative Closure. "I look forward to speeding his departure." Nathan rose to leave.

He was almost out the door when Salanga called after him. "I should advise you that Frelleger fully appreciates our obligation to assist the less worthy races."

The words sounded like exactly what the human race wanted. But unless Salanga had fallen into a momentary lapse of protocol, which was unlikely, they were still in Negative Closure. And that meant that Frelleger was going to be a problem.

Nathan reported to Saunders, his department head, and she immediately notified the UN's Division of Extraterrestrial Affairs. Before the day was out, a crisis council had been formed and Nathan had recounted his conversation with Salanga eleven times. The Ambassador's final remark was debated endlessly and repetitiously, usually by people who didn't understand the intricacies of Pulagi interactions.

When Frelleger's ship arrived eight days later, there was still no consensus about what needed to be done.

"I guess it's up to you," Saunders told Nathan. "You have the best qualifications for dealing with the Pulagi."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"As a linguist," he protested. "Not as a politician. I haven't been trained for this sort of thing."

"Insofar as the Pulagi are concerned, none of us have. So we're going to assent to Salanga's wishes."

And so it was that he stood nervously at the head of the delegation that met Frelleger's shuttle. The newcomer was a bit heavy for a Pulagi, and somewhat lighter colored than most, but otherwise he looked and dressed the same as the other Pulagi on Earth. He was accompanied by his life partner, whose birthing pouches were taut and bulging. Pulagian gender roles were even less differentiated than among humans, but their females had to put up with short periods of intense discomfort preceding each litter. Nathan stepped forward so that the newcomer would know where to direct his ceremonial opening insult.

Frelleger appraised him for a few seconds with his unblinking eyes, then spoke in his native tongue. Nathan translated quickly in his head, paled even before the official interpreter stepped forward and repeated the greetings in English. "Envoy Frelleger wishes to express his pleasure at this opportunity to visit your world."

Nathan felt his knees weakening. Opening a relationship with an Implied Compliment was a deadly insult. Should he respond in the same mode and risk offending the Envoy, or with a complimentary insult to demonstrate that humans were a civilized species? His head was spinning and he hadn't spoken his first word yet.

"We are honored by your presence despite your ungainly appearance and poor manners. A vehicle has been provided to take you to your embassy." He hoped that would be sufficiently ambiguous.

The interpreter spoke to Frelleger, whose earcaps twitched in what Nathan believed was the Pulagi's involuntary response to being caught by surprise. "Almost certainly a primitive, untrustworthy mode of transport, but I imagine it's the best that your culture can manage."

Nathan sighed with relief. Frelleger was going straight into Accelerated Denigration, a mode in which he felt much more comfortable. Maybe this wouldn't be such a disaster after all.

But just as Frelleger was slipping into the custom-designed skitter, he turned and spoke loudly enough for Nathan to hear. "Perhaps this will not be as onerous a visit as I thought."

After Frelleger had been delivered safely to his quarters, Nathan was summoned to a meeting to discuss the initial contact. Saunders was there, along with most of the senior people in the communications offices, linguists, translators, psychologists, and an even larger number from Protocol and ET Affairs. They watched a recording of the entire exchange in silence before asking Nathan for his opinion.

"Obviously Frelleger wants to terminate contact with us. His opening remark was in Cautious Approval, which is about as bad as it can get short of Fulsome Praise."

"Pulagi modes aren't linear," protested Janes from research. "You can't really say one is worse than another."

"And I'm not sure that was Cautious Approval anyway," added Nganda. "It might have been Sardonic Praise, which is a kind of Pulagian irony because in that case the literal compliment is meant to be interpreted as an insult, and is therefore not."

Nathan raised his hands for quiet, forestalling another round of pedantic arguments. "Sardonic Praise can only be used in response to Haughty Insolence. Frelleger initiated the exchange, so it had to be Cautious Approval. I responded ambiguously so that he would know that I recognized the insult but chose to ignore it. Hopefully that demonstrated that we're intelligent enough, civilized enough, for him to deal with us."

"Do we have any idea why the Envoy wants to terminate contact, if that is in

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

fact the situation?" It was someone from ET Affairs whom Nathan knew only by face.

It was Saunders who answered. Jill had been working long hours the past few days, and her face showed signs of strain. "We have an educated guess, assembled from bits and pieces the embassy officials have dropped into conversations recently. Pulagi society is no more monolithic than our own—less, if anything. They are united under a single government, but only for certain purposes. Every Pulagi chooses to join one of several political factions when they reach maturity, but once the choice is made, they can never change allegiance. We're not really comfortable that we understand how this works, particularly since members of one faction can have secondary and tertiary memberships in rival groups. In any case, different sets of laws apply to individuals based on their factional membership, even though there is no geographical separation between them."

"Sounds pretty chaotic," commented one of the political types.

"It makes a weird kind of sense. The Pulagi believe in making decisions only after examining every viewpoint. To ensure that nothing gets overlooked, they've created a system in which there are advocates for every position, even those that no one currently believes in. Salanga belongs to a faction that advocates cooperative expansion into the universe. Some of his staff belong to another which favors establishing an empire with Pulagi at the apex. Frelleger represents the isolationist viewpoint. Their goal is to quarantine the systems of other intelligent races."

"So what is the official policy of the Pulagian government?" asked Wilson, who worked in Protocol and Deportment.

"All three. And there are some other intermediary positions as well. Each individual case is decided after the various factions interact."

"Then you're saying the Pulagians are inconsistent?"

"And humans aren't?" She glared the man down. "However strange it seems to us, their system has served them well and for a long time. They were traveling to the stars when the Pyramids were being built, and they haven't fought among themselves for at least that long."

"All right, let's get back to the matter at hand." Fulghrum, from the Secretariat, was nominally in charge of the meeting, although he'd done little up till now to demonstrate his authority. "We know the desired outcome. We want the Pulagi to stay, to increase trade and technical assistance. How do we respond to this new envoy to ensure we achieve our goal?"

"Do we have to do anything?" someone asked. "I mean, he only represents one faction. How much weight does he carry?"

Nathan answered quickly. "Apparently a great deal. Salanga went out of his way to underline the importance of this visit."

"But if his faction is committed to breaking contact, and if individual factions support their established policy even if they think it's wrong in a particular case, then what's the point? Even if we convince Frelleger that we're a desirable trading partner, he'll still advocate severing relations when he returns."

Saunders nodded. "Yes, he will, but there are degrees of advocacy. The Pulagi resolve their differences of opinion by examining them from every point of view. The positions most strongly held prevail."

She paused, and Nathan finished for her. "We want Frelleger to advocate in Mild Skepticism. At the moment, he seems more inclined toward Virtuous Disharmony."

Later that same day, Nathan accompanied Frelleger, Salanga, and some minor officials on an air tour of the surrounding area. The encounter started badly; Frelleger's greeting was in Mellow Bal-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ance, which could be construed as an insult or merely indifference. Nathan took a chance and responded in Dawning Anger but Frelleger's reply in the same Mode was almost automatic. The Envoy remained silent during most of the tour, describing New Tampa as an unattractive city, which was a good sign (as well as true), but also commenting that the human built skittership seemed quite sophisticated, which meant that he found it primitive and uncomfortable.

Frelleger was equally uncommunicative during the formal briefings that followed. He listened to presentations from a variety of human officials and to reports from embassy staff who had identified a number of human products which they deemed viable as trade goods. The most surprising item was music, the only human artform that appealed to the Pulagi. It was not unusual to hear Beethoven or the Beatles from inside the Pulagi residency. A few samples were played and Frelleger characterized them as "discordant noise," which was the only positive remark he made that day. His frequent though thankfully low-key praise for the fine work the embassy staff had done left them all nearly as dispirited as Nathan and the rest of the human contingent.

The days that followed weren't any better. Frelleger remained in Implied Compliment or Casual Approval most of the time, occasionally moved into Mellow Balance, and only once resorted to Sarcastic Disdain in Nathan's presence.

On the third day, he encountered Salanga in the lobby. "You have succeeded in making the Envoy's visit less arduous than he expected." That depressed Nathan so much that he seriously considered telling Saunders that he was resigning immediately.

Instead, he made a luncheon date with Patti Cruz, who worked in the psychological profiling section. "I need something, Patti. A hook, an insight."

She shrugged. "I can't help you. We keep developing new theories, but we don't have anything close to an accurate model of their behavior patterns. That segmented psychology of theirs is very complex. Do you realize they can believe two contradictory things at once?"

"So can humans."

"Not the same way. Humans rationalize. A human can honestly believe that theft is wrong, then steal from his employer, but only because he tells himself the employer owes it to him, so it isn't really theft. A Pulagi doesn't need to rationalize. You know Sittakaper?"

He nodded.

"Sittakaper belongs to a faction which believes that females should be sterilized after their fortieth litter, but she gave birth just last month."

Nathan nodded. "Took a day off work to eat her kids. Yeah, I remember."

"Well, she's dropped more than fifty litters herself. I managed to get her to talk about the situation and she literally cannot see the contradiction. It's almost as if the two parts of her mind only examine the problem when it's necessary to make a decision, and then the part with the strongest motivation prevails."

"If that's true, then Frelleger will really believe we should be quarantined when he presents his case, even if he also really believes we should become trading partners."

"That's about the size of it."

They were silent for a while, then Nathan asked what was almost a rhetorical question. "What do the Pulagians really want?"

"Excuse me?"

"They don't really need to trade with us. Oh, they like our music, and we've done a few things with electronics that haven't occurred to them, but there's nothing we can offer that will significantly alter their culture. If they quarantine us, they'll have lost very little. But if that's the case, why did they contact us in the first place? Why even let us know they exist?"

"The other factions . . ."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"No," he cut her off. "That's not enough. They want something, need something. And if it's not trade goods, maybe it's something less palpable. Something psychological."

She thought about that for a moment. "Maybe they're lonely?"

Nathan shook his head. "No, they have active contact with at least a dozen other races. Whatever they're looking for, they haven't found anyone yet who can provide it."

"Well, why don't you ask Frelleger next time you see him?"

"I might just do that."

But he didn't. The following morning, he met with Frelleger and his mate, Cheriffa, for almost two hours without finding any way to manipulate the conversation in the right direction. Cheriffa told him that he was "annoyingly persistent," which cheered him a little, but Frelleger couldn't be bothered to move out of Mellow Balance even when Nathan resorted to an unconventional switch to Veiled Insolence. Cheriffa grew very restless toward the end of the session, and Nathan made an excuse to end early so that she could retreat to her sleeping chamber. It was obvious that she was going to drop her litter within the next twenty-four hours. And on the following day, she and Frelleger would be leaving Earth, unencumbered by offspring.

He went home, moped around until he had managed to irritate Adele, then went for a long walk to clear his head.

And had an idea.

He was awake most of the night thinking about it. Although he knew it was a long shot, he couldn't think of any other approach. If he was wrong, he might single-handedly guarantee that the human race would be quarantined. Even if he was right, he wasn't sure if he could carry it off.

Cheriffa was notably absent the following morning. Frelleger was more morose than ever, if that was possible, and the last few interviews and reports were uneventful and unpromising. As the last delegation walked out, the Envoy uncurled himself from his seat and prepared to retire to his quarters. Other than the Pulagian interpreter, Nathan was the only other being in the room.

"Envoy Frelleger, it is my distasteful task to request that you remain a short while longer."

"I suppose I could tolerate your presence briefly since my departure to more civilized regions is imminent."

Nathan was heartened by the sudden switch to Accelerated Denigration, even though that probably meant that Frelleger had decided to staunchly support quarantine and was feeling some degree of sympathy. During the morning's strategy session, he had been tempted to advance the theory he'd recently hatched, but had remained silent, fearing that they'd react badly and replace him. Now that he knew he couldn't make matters worse, he decided to put it to the test.

"I can't imagine any civilized culture which would welcome one such as you."

The interpreter hesitated before translating. Nathan had jumped directly to Haughty Insolence, bypassing several intermediate steps. Frelleger actually turned and took a step back toward him, and his earcaps betrayed his emotions. "Since you have no experience of true civilization, your words are without value."

Was that Sarcastic Disdain or Rude Condescension? No matter. He had to move from the general to the specific. "Animals may be taught to speak, but a wise being pays them no heed."

This time the interpreter remained silent until Frelleger turned to him impatiently, demanding to know what Nathan had said. It took several seconds for him to phrase his reply.

"It is easy to mock where there is no understanding."

Nathan faltered. Frelleger was backing off, trying to ease back into a less intense mood. He couldn't allow that to

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

happen; he had to play his trump now.

"I understand that you eat your own offspring. I can't imagine anything worse."

The interpreter stood frozen, incapable of speech, but it didn't matter. Nathan had studied carefully and the ultimate insult had been delivered in nearly perfect Pulagian. It needed no translation.

Nathan was with Frelleger for most of the remainder of his stay on Earth. When his shuttle lifted off, he publicly announced that he'd been thoroughly distressed throughout his visit, and Nathan was confident that he'd present his case in Mild Skepticism or perhaps even Fretful Uncertainty. The danger of quarantine was over.

When he reported this to the crisis council, they were understandably relieved, but not confident until their sources with Salanga confirmed Nathan's opinion. Several of them asked how he had managed such a dramatic turnaround, but he diverted their questions pointedly until they stopped asking. Jill Saunders watched him thoughtfully, and the two of them eventually went to her office.

She poured two brandies and let him finish his before she spoke. "You know I have to ask you for a full report."

"Yes."

"Are you going to give it to me?"

He hesitated, then sighed. "Yes, I guess so. But I formally request that it be sealed."

Her eyebrows went up. "All right, unless by its nature I have to make it public. So what happened between you and Frelleger?"

"The key is their fatally fecund reproductive cycle."

"They kill most of their kids," she said bluntly.

"Yes. And ritually consume them most of the time." He stood up and poured himself another brandy. "Our psychologists have theorized that the dichotomy between the natural instinct to preserve their young and the group instinct to match population to resources—food—caused enough stress to effectively fragment their minds. Their ability to hold contradictory opinions, their need to advocate courses of action that they don't necessarily favor, are all manifestations of something akin to human schizophrenia born of guilt. But with the Pulagi, it isn't a mental disease; it's a mental defensive system."

"None of this is new."

"No, but I extrapolated from that. It seemed to me that if this sense of guilt was so great that it had reshaped their entire psychology, that it must still be a momentous part of their everyday lives. But when they perform the actual act, it's almost casual. Salanga barbecued his last litter in the backyard, for God's sake!"

"All right, so it's a big deal."

"So why don't we ever talk to the Pulagi about it?"

Saunders looked uncomfortable. "Well, it's not the kind of thing you bring up in casual conversation, is it? What are we supposed to say? 'Hey, do you eat your kids with mustard or relish?' We're trying to be polite."

"Which is interpreted as exactly the opposite by the Pulagi. They conclude that we find the act so repulsive that we can't even talk about it. And they're right. And I'll bet the same thing is true of the other score or so races they've encountered, and certainly all the ones they quarantined. They're insulating themselves from others who are witnesses to their guilty deeds."

She looked troubled and confused. "So you brought the subject up?"

"No, I rammed it down Frelleger's throat. I told him it was the most disgusting thing I'd ever heard of. And then I proved to him that despite that fact, I wanted to be his friend."

"And how did you do that?"

This time Nathan was the one who looked uncomfortable. He tossed down his brandy and stared into the distance.

"I helped him eat his kids."■

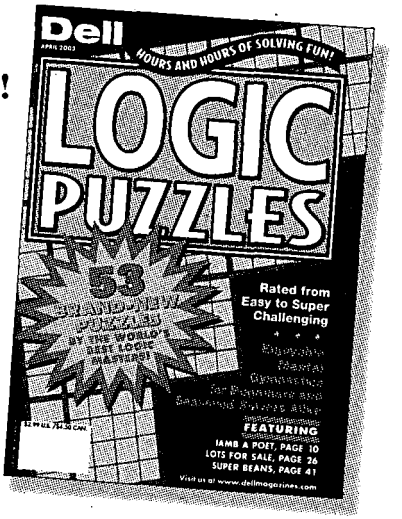
LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Dell Logic Puzzles Direct to Your Door!

If you love solving mysteries, you'll love **Dell Logic Puzzles!**

Each issue delivers more than 50 spell-binding logic problems by the world's best logic masters.

Subscribe today and you'll get every intriguing issue delivered direct to your door and save 10%. Six issues, just $15.97.



To charge your order by phone, call toll free:
1-800-220-7443 (9am-5pm EST) *Orders only please!*

Mail to: **Dell Magazines**
Suite S, 6 Prowitt St.,
Norwalk, CT 06855-1220

☑ **YES!** Enter my subscription to **Dell Logic Puzzles** (LOG) as indicated below.

❑ 1 year, (6 issues) $15.97

❑ 2 years, (12 issues) $28.97

❑ My payment is enclosed (U.S. funds) ❑ Bill me

Name _____
(Please Print)

Address _____

City _____

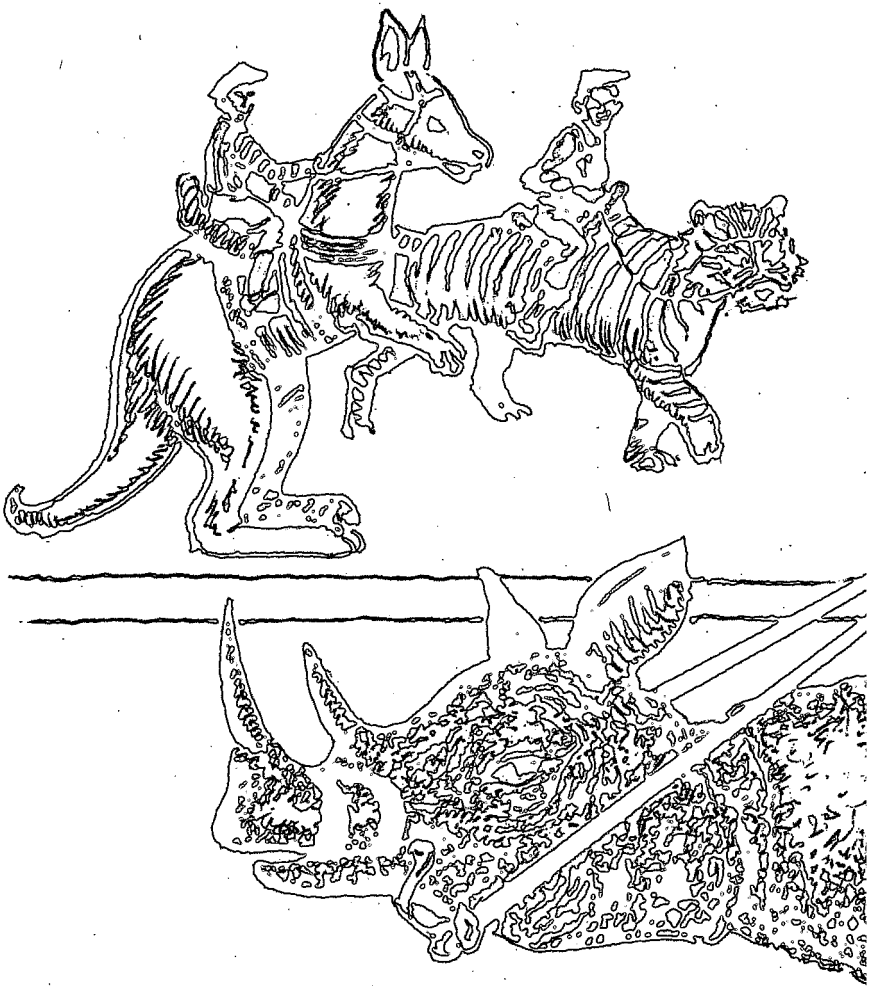
State _____ ZIP _____

Please allow 6 to 8 weeks for delivery of first issue. Canadian and foreign orders add $5 per year (U.S. funds). Offer expires 6/30/04. 53F-CMLSLL

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

SHOOTOUT at the NOKAI CORRAL

Conclusion

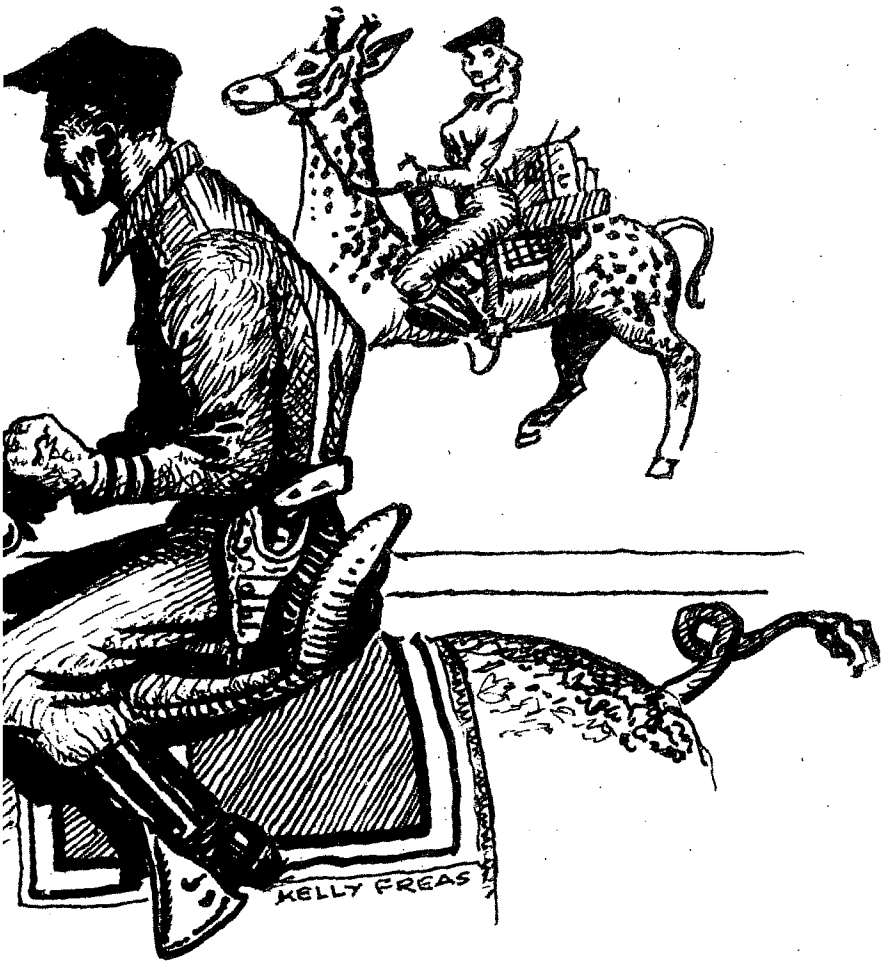


LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Rajnar Vajra

Illustration by Kelly Freas

Some problems have to be solved,
but it's just as essential to find
a good *way* to solve them.



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Our story so far . . .

Time: Several centuries hence.

Place: The small town of Sunstone, Red Clay County, Tenderfoot Continent, on an Earthlike world named Paladin.

Background: Paladin is one of the twelve theme planets colonized to find an answer to a terrible despair infecting terrestrial humanity. Each theme planet has an individualized artificial society. Paladin's culture stems from an idealized American Old West, with the "cowboy" role filled by people of the usual mixed blood (Chinese being the most common denominator). "Indians" are groups of Jews and Hindus deemed by social physicists to have the proper cultural valence.

Paladin's secondary experiment is to accelerate biological sciences by forbidding all other advanced technologies. On Paladin, electrical devices are illegal except in one city: Buildem.

Earth agents, proctors, armed with condescending attitudes backed up by devastating weapons, roam Paladin to monitor events. The colonists loathe them.

On this theme planet, law enforcement is managed by licensed, private, law agencies. Most leading marshals are "slingers": genetically augmented humans. Unfortunately, most leading criminals are also slingers. . . .

Story: A stranger appears in Sunstone, riding a genetically tweaked designer zebra. After being dismayed by the townspeople's fearful attitude, he introduces himself to the local sheriff, Chou Larker, as Marshal John "Silver" Davies, one of Tornado Carter's Dust Devils, a highly respected agency.

Chou is impressed at meeting Davies, renowned, even among top slingers, for sharp-shooting accuracy. John explains that he has come to evaluate the town's need, to see if Sunstone's predicament justifies taking up the Dust Devils' limited time.

Chou Larker is enraged until the slinger explains *why* the Dust Devils lack time: for years, an unknown outlaw gang has been ambushing marshals. These attacks have so drastically pared the agencies that those still extant have to pull triple duty to fill the need while hiding the situation from the proctors. If Earth learns the truth, the authorities will undoubtedly declare martial law and Paladin's citizens will lose personal freedom.

Chou states that the infamous Dirty Jake, widely known as Paladin's only hit-and-run bandit, has finally hit and stayed put. Jake's Mudslingers, a crew of murderers and rapists, have set up camp near Sunstone and the outlaws are terrifying the populace and draining local resources.

Worse, Jake has procured a powerful illegal off-planet weapon: a portable ion-plasma cannon. This "blast-torch" acts as a hellish combination flamethrower and lightning-generator.

John is flabbergasted by Chou's next statement: Shining Wing Krishna, chief of the Paladin Anasazi (the local Indian tribe), claims to have recognized Dirty Jake when they met. Despite intense cosmetic surgery, Shining Wing positively identified the outlaw as William Caine, the legendary marshal.

John doubts this because Caine was supposedly killed in an ambush years earlier, and the man was the ultimate straight shooter in every sense. Still, Chou's confidence in the chief's perceptiveness leaves John shaken.

After accepting the assignment, John is alarmed when a gaunt slinger, eight feet tall, suddenly rides into town. John recognizes him as Hangman, an executioner who lost his job recently, when his agency was ambushed.

John and Chou walk past a blond woman whom John admired earlier. The sheriff says her name is Dana Rider and she's the owner of the Sunstone Saloon and Grill. And single.

The sheriff insists that John bunk with

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

his family. John agrees. They park John's belongings at Chou's nearby residence, then head toward the saloon for food and a close examination of burn marks from Jake's cannon.

The marks are chilling and John notices another disturbing item: on a wall map of Tenderfoot Continent, someone has stabbed a fork into the coastal town of Strake, long since wiped out in a tsunami. The wall is modified rock-hard maple, so the stabber had to be incredibly fast and strong.

John meets several Paladin Anasazi, including Chief Shining Wing. Shining Wing is as perceptive as Chou had claimed, and John cautions himself to say little. John hasn't been entirely truthful with the townspeople and doesn't want his secrets exposed prematurely.

Hangman enters the saloon and he and John talk briefly. To John's surprise, Hangman requests a job, but not as an executioner. Despite misgivings, the marshal promises to consider the proposal. Hangman also warns of a man sitting in a third-floor hotel room across the street, aiming a rifle down at the saloon entrance, muttering threats.

Chou Larker, when apprised of this, explains that the rifleman is the town drunk, Coby Patterson, who has hated slingers ever since a slinger's carnivorous steed opted for one of Coby's arms in lieu of lunch. Chou declares that the man is harmless because he never actually shoots his rifle—and besides, the townspeople have given him bad ammo.

The sheriff introduces John to Dana Rider and the two hit it off. John learns that Dana, a music lover, commissioned a pipe company to produce a cornet. This prototype, she claims, makes sounds so atrocious that she had to stop practicing because it was upsetting the local steeds.

She states that Dirty Jake was responsible for the stuck fork.

After a pleasant evening with Chou's family, John falls asleep in a guest room. He awakens with Chou shaking him. When he sees how terribly the sheriff's face is injured, he comes fully awake. Apparently, two slinger outlaws were threatening Dana at her saloon and when Chou tried to interfere, one slinger slapped him. Badly hurt and knowing he was outclassed, he ran to get John.

John dashes from the house toward town. Before reaching the saloon, he muddies his face and enters the saloon acting intoxicated. Neither outlaw has John's top slinger abilities. Dismissing the drunk as a mere nuisance, the Mudslingers are taken by surprise when he pulls them off their barstools and drags them both outside.

The gangsters try to draw their guns. John shoots all four guns out of the outlaws' holsters. The Mudslingers are cowed, but the arrival of a small man riding a horse-sized wolverine puts fear into John's own heart. The newcomer is Malachite Preston, the Greenstone Kid, and he knows what John has been hiding. If Malachite speaks a certain word in Dirty Jake's ear, and Jake really is William Caine, John is as good as dead.

To further complicate matters, bullets rain down from the hotel. Evidently, Coby's ammo wasn't as bad as advertised. Luckily, the man's aim is poor. After hearing Coby's story, John is determined to stop the drunk without harming him, yet John can't afford to let Malachite leave Sunstone. John improvises a plan to distract both Malachite and Coby. After commanding Malachite to let him handle the situation, John runs across the street, intending to run straight up the wall of the building, to the third floor. Only one problem; he hasn't practiced this maneuver for twenty years.

Upon reaching Coby's room, John finds that Hangman has disarmed the drunk. After thanking and dismissing Hangman (who asks to be called by his real name: Kelly Walsh), John talks with

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Coby. The marshal shouldn't be leaving Malachite alone, but Coby's need is overwhelming. Coby is so moved by John's compassion that he resolves to change his life around. When John leaves the hotel, Malachite is gone.

John feels doomed.

Still, when he and Dana help the sheriff to the doctor's office, they run into unexpected help. Carter's Dust Devils have arrived unexpectedly. Two are giants: Henri Jacques and the even larger Joe Li, called "Lo Pan" (Pinyan for compass) by his friends because he always knows where to point. Joe's intuition warned that John would need help. The other marshals are the small, ultra-quick Lilly Li, and a wry, sly, well-groomed fellow very unlike Dana's concept of Tornado Carter.

Which makes sense. John finally admits the truth: the newcomer is the real John "Silver" Davies, usually referred to as "Dave." John himself is John "Tornado" Carter.

After getting Chou patched up, the Dust Devils hold a war council in Dana's saloon. John fills his associates in and warns that once Malachite tells Jake that John's in town, the Mudslingers will be showing up to kill John. William Caine knew John well and knows how clever the lawman can be.

Hangman interrupts, demonstrating surprising physical prowess and offering some upsetting information. He backtracked the outlaws who ambushed his agency and discovered they were Mudslingers. By implication, Caine is the man behind *all* the ambushes. Hangman also located a huge barn where unknown animals are being raised.

With the help of Dana, Hangman, the Dust Devils, and the townspeople, John sets a trap for Dirty Jake, burying propane-filled tubing beneath Sunstone's muddy Main Street. Blast-torches have one vulnerability: if overheated, they'll explode. A large tank is also buried to act as John's refuge.

In the morning, a team of Mudslingers appears; most are marshals presumed dead. Jake really is Caine. He's riding a new kind of beast, a giant carnivorous kangaroo.

John, waiting in the street, taunts Caine, who demonstrates the power of his blast-torch. John's plan works almost too well. The street bursts into flame and the plasma cannon explodes. Hiding in the tank, John burns his hands pushing the temporary roof away. He emerges to find nearby buildings blackened and the Mudslingers gone except for the corpses of Malachite Preston and Caine.

Only Caine isn't dead, just terribly burned. More illegal Earth technology has somehow preserved his life. He rises and challenges John to a duel, then escapes by jumping away in impossibly long and rapid leaps.

Seeing John's injuries, Dana insists that he stay with her until his hands recover. Feeling guilty because he knows he can't survive a duel with Caine and has no business starting a romance, John accepts.

Waking up in the night, Dana sleeping by his side, John remembers something important: after realizing that Chief Shining Wing must have recognized him, Caine had remarked that he'd have to "adjust his plans." The Paladin Anasazi are in danger.

In the morning, John rides up to New Nokai Dome to seek out Shining Wing's people. En route, he passes Dana's family ranch, the Nokai Corral.

Before he finds the Anasazi, he's attacked by six terrifying beasts similar to Caine's steed but larger, fitted with high-tech eyepieces and metal helmets. John shoots most of them, but one kills his beloved zebra, Houston, and nearly kills him. At the last moment, Lo Pan rescues him, but in doing so is badly injured. Shining Wing and a team of warriors arrive, deal with the last monster, and improvise a stretcher for Lo Pan. The giant receives advanced medical attention and

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

John receives a strange gift: a liquid based on modified cuttlefish cells that Indian Scouts use to make themselves undetectable.

Chief Krishna offers an even more spectacular gift. Since John's zebra is dead, the chief gives John a new steed, Indra, a unique oversized white buffalo with a single, unicorn-like horn. John is overwhelmed by the Anasazi's generosity, but accepts.

John feels that the chief's gifts will be great assets in the upcoming duel with William Caine, but he knows they won't be nearly enough. . . .

Chapter 21

Despite John's good intentions, he didn't leave New Nokai Dome until late afternoon.

Learning to ride his buffalo was easy although it felt strange being so far off the ground and sitting on a creature radiating such naked power. Indra responded instantly to gentle tugs on the reins, which were attached to a band circling the buffalo's horn rather than to a bit. He followed simple spoken commands in English, Hindi, and Yiddish—a trilingual beast.

John was already proficient in using reclining-style seats, which were needed when a person of normal size and flexibility rode an animal with an extremely broad back. But he disliked recliners. He particularly hated the inevitable random slaps from the headrest atop the tilted cantle. Having to use rigidly mounted high stirrups and handgrips to keep from slipping off left him insecure. He much preferred using his legs. Despite the considerable height of the saddle's underlying "tree," it was impossible to see the immediate ground ahead without sitting up and risking a fall. Luckily, Indra's fatty hump wasn't large enough to block the entire forward view. John was grateful that bison have such low-hanging heads.

But the clear horn seemed to constantly split the world ahead into two parts.

After John finally dismounted, Shining Wing pulled two wrapped pastries, a container of water, and some large and strange-looking fruit from his pouch. The two men sat on a bench and ate lunch while the chief lectured on the "care and feeding of fabulous myths." John found the still warm "paknish" pastry interesting and pleasant, with mixed flavors of potato, onion, pepper, curry, and goat cheese. The gene-tailored fruit was delicious: peach-skinned, seedless grapefruit without a hint of bitterness. But he only paid token attention to the food; he was too busy listening and learning.

Indra was as unique internally as he was externally. His metabolism was incredibly efficient and his food requirements surprisingly modest. But such efficiency had a liability: Indra would become vitamin deficient if John wasn't careful. The bison's hooves also needed a daily vegetable oil treatment; there was appreciable weight on those hooves and if they became brittle, they would swiftly crack.

Shining Wing fetched a jar of grapeseed oil from the shed and Indra patiently lifted one foot at a time as the chief demonstrated the proper technique.

There were a hundred such details, which John dutifully memorized. Shining Wing finished his instructions, gave his student a sharp look, and began firing off questions to see what had been retained. He seemed to enjoy the answers tremendously and his smile kept broadening with every correct response. When he was satisfied, he declared John the "ideal student" and promised to send him a written recapitulation as soon he could get around to it.

John tried to express the depths of his appreciation for the tribe's outrageous generosity. In return, Shining Wing thanked John for his patience and graciousness.

"We're all done here," the chief avowed. "Let's feed your greedy gift a

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

few more treats I've got tucked away then we'll both ride him back to the pueblo. Ah! From your expression, I know what you're thinking, my friend. How can two people ride on one recliner? Without extreme intimacy, that is."

John laughed. "Something like that."

Shining Wing opened the gate to Indra's corral, muttered a soft phrase in Hindi, and climbed atop the bison's head when Indra obediently lowered it to the ground. The chief's weight didn't appear to bother the great bison in the least.

"This horn is convenient to hang onto," the Anasazi stated dryly. "But I fear it makes me look overly . . . concupiscent."

John had to laugh again. "The grandfather of all boners! But on you, it looks good."

"Now you sound just like our rabbi. Hop on. I'll drive."

Indra trotted along as if he weighed almost nothing and his passengers even less. After they'd gone through the tunnel and Shining Wing had re-latched the gate, the Indian let their steed pick his own pace. John couldn't believe how fast that pace was.

When they reached the terraced hillside, Indra barely slowed. He ran up the broad steps with sure-footed grace and without bowling anyone over.

"I'd love to meet your geneticist," John called loudly to be heard over the rushing wind.

"What's that?"

John repeated the statement, bellowing this time.

"Ah! You already have, my friend, although I can only take *most* of the credit. We Anasazi work as a team."

John stared at the chief's slender back. Evidently Indra, he told himself, isn't the only one around here who's chock full of surprises.

Without prompting, the bison decelerated to a slow walk on the pueblo's main concourse. Shining Wing brought him to a stop near the medicine center. No one looked surprised or dismayed to find a giant buffalo suddenly in the street or showed concern about standing within inches of a needle-sharp horn. No one displayed a hint of resentment at John's evident new relationship with the Tribal pet. People merely smiled and gave Indra an affectionate pat or two as they passed. The two men jumped down amid a flurry of activity.

Anasazi had found the missing guns and someone had cleaned them inside and out; John inspected them carefully: they were ready to use and neither was badly scratched. Some kindly soul had located his gun-belt and skillfully stitched up the torn section.

John's jacket was clean and dry; his badge sparkled from a recent bout with jeweler's rouge. But he grimaced when he saw his saddlebags. They were still bloody; there hadn't been enough time to wash them. He felt an almost overpowering sense of loss when he realized how ridiculous these things would look on an animal the size of Indra. But he no longer needed the old bags. His belongings, including the sad remains of Dana's basket, had been salvaged and placed into huge tank-leather sacks that fit nicely on the white bison.

Rabbi Grinning Bear, fully visible again, handed John a small brown jar with a double lid.

"Spend it all in one place," he advised.

"Thank you, Rabbi. This is the . . . Kachina Cloak? How do I use it?"

With a tilt of the head and an arm flourish, Grinning Bear invited the chief to answer. Shining Wing bowed as if he were being honored.

"The jar is divided into two sections, Marshal, each with its own lid. Open the white one first, pour the fluid inside directly on your back, *over* your clothes, and wait for about thirty seconds. Got that so far?"

"White lid for back. Count to thirty."

"Precisely. That first fluid is the 'eye' of the cloak and its regulator. Then, care-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

fully, take off the black lid and pour what's inside on the top of your bare head. There'll be a little extra just in case, but don't spill too much."

"I won't."

"You'll see the cloak slowly spreading over your body. Watch closely and when it reaches the top of your feet, jump as high as you can. Well . . . in your case, jump as high as the good rabbi here can."

Grinning Bear rolled his eyes.

"Why jump?"

"If the ointment touches the dirt before it, ah, meets itself in the last open spot, it will try to cover as much dirt as possible. The dirt doesn't need a disguise, you do."

"So the instant I'm completely covered, the spreading process stops?"

"What a pleasure it is, Marshal, instructing an agile mind! Ah me. I only wish you didn't have to leave us so soon."

"I'll be back. You're one hell of a teacher, Chief. Anything else I need to know about the cloak?"

"Do you remember what I told you in the Kiva?"

"Stand with my back near, but not touching, an uneven and colorful surface. And I shouldn't shout out things like, 'Hey, I'm over here.'"

The chief nodded. "Then there's only one important thing to add: don't sprinkle salt on the cloak. The cells are in very delicate balance. And don't worry about the smell, it will dissipate quickly. After that the cloak will actually minimize your body odors."

"How long will it last?"

"That depends. The effect should be at its peak for a half hour or so—less on a dry day—but the more you sweat, the sooner it will fade due to salt."

"Now that that's taken care of," Grinning Bear said with a trace of impatience, "I'd like to show you gentlemen two very odd items. Could I impose on you, Marshal, by asking you to stick around for a few more minutes?"

John was feeling guilty for letting Lilly worry for so long and he was feverishly eager to warn everyone in Sunstone about Caine's monsters. But he couldn't say no. "Of course, Rabbi. I'm greatly indebted to you and your tribe."

"Mechanical things are far out of my depth."

"Mechanical things?"

"Last I knew, Devorah Rothschild was carrying them around, trying to find anyone who knew what they were. Unfortunately, I don't see Dev anywhere at—wait! There she is!" The rabbi pointed up toward a muscular woman just climbing down from one of cliff's many alcoves.

"Over here, Dev!" Grinning Bear called out as the young woman reached the road. She jogged over, looking grim until she smiled at Indra. John recognized her as one of the warriors who'd rescued him on the plateau.

"Namiste!" she huffed. "I'm getting winded from all this climbing. What can I do for you, Rabbi?"

"Do you still have the objects we were talking about earlier?"

"Right here," she answered as she took off a backpack and reached inside. "I've shown 'em to thirty people so far—got thirty blank looks."

She pulled out one of the glossy "goggles" that John had last seen protecting the eyes of Caine's monsters. Next, came one of the metallic discs the animals had worn on the back of their heads.

"You don't suppose," Grinning Bear said nervously, "this hat is the latest model yarmulke?"

Shining Wing picked up the eyepiece, examined it from all sides, and turned to the woman. "Was it you who retrieved these things, dear?"

"It was."

"Ah, that must have been an unpleasant task! But did you notice these funny little holes on the side of this thing? Was this, ah, spectacle connected with the helmet somehow, perhaps with wires?"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"How did you know that, Chief? The wires were so small I didn't see them at first. I accidentally broke 'em off when I tugged that lens free."

"Lens?"

She shrugged. "It reminds me of a camera lens—a little. And it had been *glued* on, if you can believe it!"

"You might be surprised at what I can believe today."

She nodded unhappily. "It's been one of those days, hasn't it? And there's something else: the hat itself had other wires sticking out the bottom. What do you suppose *they* were connected to?"

Shining Wing shook his head like someone with a good guess, but who wasn't eager to express it.

"They ran through tiny holes in the animal's skull."

The chief's jaw tightened. He silently handed over the goggle to John who looked it over and then held it up to the light. To his surprise, the object was opaque. Yet, the monsters had worn these over their eyes. . . .

"I think," Shining Wing said thoughtfully, "that before too long we should go back to the plateau and detach *all* the wires, Dev."

"Why?"

The chief looked in turn at Devorah, Grinning Bear, and John. "That word 'lens' reminded me of something. He hesitated for a moment as if he were gathering strength. "Ever spend much time in Buildem, Marshal?"

"Lots while I was in Slinger School."

"Then you've seen the 'Wonders Of Science' exhibition?"

"In the Tesla complex? Sure, but not since I was a kid."

"Last time I visited, they had what the tour guide referred to as an 'old-fashioned video machine' from Earth." The chief took in a slow breath. "This video machine was like a camera, but far more powerful. The guide did a demonstration. He put a small box near one of the Tesla staff members who was sitting at a table, crocheting, and we visitors could judge her skill by watching her moving image on a screen across the room."

"How is that possible?" Grinning Bear asked dubiously.

"Apparently, a lens in the box focuses light onto a special kind of crystal, which converts light into something called 'microwaves.' These microwaves are picked up by another crystal 'tuned' somehow to the first and it acts in the opposite manner, changing the microwaves back into visible light."

John's knees suddenly felt hollow and his voice sounded strange when he spoke. "You mean—are you suggesting someone was using each of Caine's monsters as a kind of . . . animated camera tripod? Lord! Mudslingers could be watching the plateau right now!"

The chief nodded bleakly. "I'm afraid that's the nicest part of what I'm thinking."

"But how did the creatures see while wearing such things?"

"Perhaps in operation, the lenses turn clear. Or maybe images appear inside them as well as wherever the, um, receiver might be."

John stared down unhappily at the smooth, glassy object. "I wish I thought you were wrong about this."

"I'd love to be wrong."

"Wouldn't this thing need electricity to operate?"

"I imagine so. Perhaps the helmet generates power."

John forced himself to ask the next question. "But you suspect the helmet wasn't there just to provide electricity?"

Shining Wing glanced over at Indra who was stretched out on the ground, licking his fur. John, following the older man's gaze, wondered if the bison ever accidentally pricked himself with his own horn. . . .

"As to the helmet, another device from the Wonders Of Science exhibit comes to mind," said the chief very softly. "Tell me, Marshal, are you familiar with the concept 'remote control'?"

Ten minutes later, John left the pueblo

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

in a distinctly somber mood.

Indra was too broad in the beam to squeeze through the shortcut's narrow spot, so John took the main road. Fortunately, the white buffalo's speed more than made up for the extra distance. In truth, John was glad to have an excuse to avoid revisiting the plateau. In some ways, he would have liked a chance for a final farewell to Houston, but was afraid it would hurt too much.

Obeying the chief's simple directions, he followed a wide, well-maintained path that meandered a bit as if it couldn't quite concentrate.

The bison ran like a shooting star: swift, bright, and graceful. The miles melted away. The animal was so responsive to its rider's wishes that John found himself issuing polite requests rather than orders. In addition, he soon realized that Indra wasn't breathing hard or sweating much and he speculated on just how much faster his steed could move.

"We'll wait until the road is straight and flat, Indra. Then, if you're willing, we'll see what you can do."

Two Indian sentries were waiting near the carved rocks where the main trail and shortcut merged. One man was posted on a rock; the other stood on the trail, an oversized wooden hammer resting on one shoulder. A flat metal plate had been spiked to the ground and John remembered Sheriff Larker talking about "thumpers," the Anasazi signaling innovation. The Indians silently waved as John passed.

The sun wasn't setting yet, but it was definitely looking discouraged as Indra traveled sure-footedly down the mountain. The temperature rose a bit. John smelled a coppery tang in the air. He found himself thinking about Houston, like a person who'd lost a tooth and who couldn't stop tonguing the cavity. At this moment, he felt rather numb and was puzzled by a dampness that cooled his cheeks whenever Indra had to move slower. Finally, he realized tears were flowing from his eyes as if expressing their own, detached grief.

As they reached the base of the mountain, John had something new to worry about. He felt as if he were about to topple off the saddle. He kept adjusting his posture but couldn't seem to get himself balanced. Then, all at once, everything shifted. Now, it was the world that seemed uncomfortably tilted, not him. At first, he guessed something had gone wrong with his inner ears, but then he saw a more unusual possibility. . . .

"Say, Indra? Do you suppose this is what *Joe* feels when something isn't . . . quite right? I hope not; can't say I like it much."

The bison accelerated as the road became less steep. Icy wind began whipping John's eyes and he was grateful for the partial shelter of Indra's hump. He tried to estimate their speed, but didn't trust even his most conservative estimate. One thing for sure: this bison was faster than any land animal he knew of. And Indra didn't even appear to be trying!

It seemed a matter of small moments before the Nokai Corral came into view. John's dizziness abruptly shot from uncomfortable to intolerable.

"Whoa, Indra. Take it easy." Shining Wing hadn't listed either "whoa" or "easy" as part of the bison's vocabulary, but the animal immediately slowed to a walk.

A tall man whose face was in shadow was sitting on a weathered section of wooden fence near the Corral's open gateway, a long blade of grass dangling from his lips. John nodded to himself. It wasn't the world that was indefinably tilted, nor was his body. It was his *expectations* that were off. Even with this insight, he was within three yards of the fence before he fully admitted to himself that the man he was staring at really was William Caine.

John dismounted, automatically plac-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ing a hand on Indra's side to make sure the animal wasn't overheated. He could feel the bison's mighty heart beating surely and slowly, which seemed ironic since his own heart was pounding fast against the inside of his cracked ribs.

Caine nodded and spat out the grass. "I want a word with you, Tornado, if you're not too busy."

John kept staring. He'd known in his bones that Dirty Jake wouldn't die of his burns; the man seemed too tough to do anything so human as die. But who would have expected him to be *active* already? Caine's face and hands were glossy, largely covered with artificial skin that reflected little but twilight shadows. Here was the twenty-third century version of a golem: a man made of plastic.

He was wearing his distinctive Colt 1911 handguns: blocky-looking, heavy reproductions customized with steel frames, the only such pistols on Paladin. John remembered how Caine had earned them. This knowledge wasn't comforting.

Years ago, a proctor had turned renegade. Earth, anxious to prevent rebellious ideas from contaminating other proctors, had ordered Caine to track down and retrieve the rebel. The task was perilous; the quarry was a walking arsenal of devastating weapons. Nevertheless, Caine succeeded. Earth granted him a reward: a unique dispensation to carry autoloading guns, which use magazines, springs, and expanding gasses to reload rather than revolving cylinders. Even if they'd been legal, few slingers would have chosen autoloaders; revolvers were generally considered more reliable and accurate. But Caine's modified 1911s had one big advantage: each held fourteen bullets at once.

"What are you doing here, Bill?" John asked in the firmest voice he could manage.

"Waiting for you. Fine animal you got there, son. Striking. But I'm sorry about what happened to that zebra of yours. I remember how you love your zebras."

John's eyes narrowed. This apology was surprising, but more surprising was the tacit admission that Caine had been observing events on the plateau. Why was he giving so much away?

"What happened today was your doing, wasn't it?"

Caine shrugged and jumped down from the fence, moving like a man at the peak of health. "Yes and no. I wanted to test Arjun Krishna's defenses. That little man worries me. But damn it straight to hell! We lost control over our animals when you showed up and started shooting." Now the outlaw had essentially confessed to using the "remote control" technique Shining Wing had described! "We were trying to scare you off at first. But our system seems to have a few, what they call on Earth, 'bugs' to work out."

"Why are you telling me all this? What makes you so sure I figured out what the . . . lenses and those helmets were for?"

"You're a clever son of a bitch, Tornado. But Arjun is something else. I knew that even if you were stumped he'd work it out."

"What do you want from me? Are you here just to apologize?"

"That too. But I mainly wanted to tell you I changed my mind."

"About what? The duel?" John felt a sudden, hot burst of hope and was immediately disgusted at his own weakness.

"Shit no, son. That's still on the itinerary if you can't see plain reason when it pokes you in the eyeball. And the date hasn't changed either. But maybe I was a bit hasty in deciding to wait until the last minute before I told you why what I've been doing is so needful. I reckon you should get more than a few moments to think it over."

"I'm listening."

"You bet you are. And I plan to be talking, but first I want to cut a deal or I'm not going to say a thing."

"Go on."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Terms are simple. You give me your word to keep the story to yourself for six days; and don't fret: your silence won't harm a soul. In return I'll agree to leave everybody in this county alone for the same period of time."

"Including the Anasazi?" If Caine was sincere, this was an incredible offer. . . .

"I said everybody, didn't I? I'm betting Arjun got my message today; he'll keep things under his turban for a bit longer. Six days from now, you'll either be working for me again or you'll be rotting in a compost heap."

"What if I win?"

"Your luck ain't that good, son. But if I'm the one fated to die then I *especially* want you to know what I've been fighting for. And you can go ahead and tell whomever you want. But, I warn you, if proctors catch one word of this, you're going to wish you'd *lost* the duel."

John couldn't see that he had much choice here, but it was odd. First, the Kachina Cloak, now this. He was rapidly becoming a repository for other people's secrets.

"All right. I agree to the terms."

"Then park that brute of yours out here—I don't want it any too close to my Glinda, who's waiting back of the house there—and we'll find a comfy spot for a private chat. Hold it! I forgot to ask," Caine's voice had turned sarcastic. "Maybe you think you've got enough of a handle on this situation to arrest me right now?"

John didn't bother to answer.

Indra patiently suffered being tied to the fence but gave John a sardonic look as if to say, "You know I could snap these reins as easily as boiled spaghetti." The marshal patted his bison's side, turned, and hurried to catch up to Caine who was already walking beneath the wrought-iron sign with the Anasazi symbols. Kokopelli or Krishnapelli, the hunchback flute-player, seemed to nod at him as the sign caught a gust of wind.

The two men sat cross-legged on the ranch house's back porch, facing each other warily. The beauty of the spaulted maple floor beneath them was almost entirely obscured by dust.

"Glinda" turned out to be the horror Caine had been riding yesterday morning. The altered kangaroo, guzzling rainwater from a rusty trough behind the porch, looked almost harmless compared to its larger cousins, but John shuddered every time he looked at it.

"What do you call those things?" he asked, pointing at Glinda.

"Rootiles. Know something? I like this ranch. Always wanted a place like this to settle down." The outlaw seemed reluctant to get down to business and John spent the extra time trying to push both resentment and fear aside so that he could listen with an open mind.

Caine had left his eyes their natural color. His sapphire gaze seemed to burn into John's soul. "This spread looks abandoned, son, but someone keeps this house in decent repair. Inside, the place is clean." John suspected the "someone" was Dana, who wasn't going to enjoy learning that Mudslingers had broken into her family home.

The outlaw tilted his head back reflectively. "It's a big house, bigger than it looks from the outside. Shit, if I'd known about this place before coming to Red Clay County, I would've moved here rather than Aurado."

"Why did you come to this county at all?"

"Well, it's a fine place to hide a big gang, isn't it?"

John kept his expression neutral. "There's more to it."

"Think so?" The outlaw gave John a hooded look. "Should you just happen to be right, I'm not planning to discuss the matter until you're a Mudslinger."

"I see. Look, Bill, I'm in a rush today. If you've got something to say, say it."

"Remember the last case we worked on together before you left to start your own agency? On the East Coast?"

"Of course. We broke up Hell's Belles.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

How could I forget?"

"You'd be surprised what people can forget in twenty years. But let's test your memory. Do you happen to recall a female slinger, one of the gang-leaders, whose hair was black as midnight except for a red streak on one side like . . . like an early sunrise?"

"Vaguely." John was surprised at the poetic description. "Marie something?"

"Marie Fernandez. I took an interest in that one. Something told me she was worth some effort."

John frowned, unsure where this was headed. "Did you succeed?"

"Hard to say. But I married her."

"What the hell, Bill? I never heard you were married."

"We kept it quiet. I had enemies as you know. And a wife and kids gave me a weak side."

"You have *kids*?"

"Shut up and listen. Sixteen years ago, my wife took our son Glen and the baby, Jenny, to visit her relatives in—on the far East Coast." The outlaw's voice was almost a monotone now. His face had become stiff and inexpressive.

John suddenly knew what was coming next, and he braced himself. "They went to Strake?" he asked gently.

"My whole family. Taken by the flood, just . . . like . . . that. My boy, he was three years old.

"He used to have a favorite toy, this little stuffed giraffe. He carried it everywhere." Caine's eyes were shimmering from unshed tears. "God knows why, but he named it 'Richard Whispers.' Thing was, that giraffe loved to talk, but Glen had heard somewhere that giraffes don't make noises so he figured its voice was so quiet, it had to put its mouth right in your ear to be heard."

John felt as if his throat muscles were in knots and could only express his acute empathy by nodding.

Caine didn't seem to see him. "That damn toy. You'd be having a normal conversation with someone; next thing you knew, something would be tickling your ear. And you'd turn and see Glen looking serious as hell and you had to ask him what the giraffe had just said and then *respond*. I swear to God, Tornado, I'd give my right arm to feel that bloody giraffe in my ear again."

"Lord, Bill! I'm sorry."

"I've lost people I love before; so have you. How can we help it in our line of work?" John didn't point out that they were no longer in the same line of work. "But this was different. I couldn't function."

"I can imagine."

Caine studied his former protégé speculatively. "Maybe you can. Let's test your memory again: remember a terrestrial military officer who used to visit me on occasion? He ferried proctors from Earth to Paladin?"

"Sir Gregory Tormuelson."

"Right on the tip of your tongue, huh?"

"For some reason, I've been thinking about him lately. Maybe it's because he impressed me so much."

"How so?"

"Is this relevant?"

"Just answer the blasted question."

John raised his hands in surrender. "All right, keep your shirt on. I admired his—I guess 'flexibility' is the right word. He'd do his damnedest to think things through logically, but then he wouldn't cling to his own conclusions. Never met anyone so willing to admit they'd been wrong. I often wish I could be more like him in that respect."

"I don't. But it's a good thing *he* was flexible! Logic or no, he had a habit of making . . . statuesque mistakes."

"Like what?"

"He told me once that on his first flight to Paladin he reasoned out that when he got here, he'd have big advantages over the average native."

John shrugged. "Better education?"

"That wasn't it. Because he grew up on Earth and his bubble-ship maintained the same gravity, he reckoned he'd be stronger than a native and his reaction

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

time quicker.

"Then he landed and looked around and realized that life wasn't so simple. Human muscular potential is what it is. You can hoist bigger dumbbells here. And there are other factors besides how fast things fall that develop reaction time. Like having to compensate for lesser traction. Faster running speeds mean—"

"How the hell is this relevant?"

"You keep *your* shirt on, son. The point we've both made is that Greg is a man who's easy to fool, but hard to keep fooled. He came to see me shortly after I lost my family and it wasn't a social visit."

"What do you mean?"

"His latest batch of proctors had finished up their research early and were hanging around Buildem, killing time, comparing notes. They weren't due to head back to Earth for weeks yet. Several were conducting a private experiment: seeing how fast the local bars could refill their stock."

John squelched his impatience; complaints would only delay this.

Caine nodded as if acknowledging John's restraint. "One night, Greg was at a bar with two drunk proctors and one of 'em let something slip. The asshole was arguing some trivial point and blurted out: 'I could prove you're wrong if I could lay my hands on the Boone file.' Then both proctors turned pale and stared hard at Greg who pretended he hadn't heard a thing."

"Who's this Boone?"

"I don't know, but it's not important. Just *listen*. You know how Greg is. The incident started him questioning his assumptions and everyone else's assumptions too. And, sure enough, he came up with some . . . discrepancies."

John felt a sharp, unexpected squeeze of alarm. "Such as?"

"Such as the common belief that Paladin is more advanced than Earth in biological sciences."

"Are you saying it's *not*? Wasn't our 'mono-science' experiment half the point in setting up this world?"

"That's what everyone's supposed to think, even Earthlings. Greg hadn't doubted it himself before because he'd never really thought about it. But, as he told me, he knew damn well that no other science works that way. You get more advancement by *including* collateral sciences."

"But . . . but Earth doesn't have slingers or enhanced animals. Does it?"

"Maybe not, but Greg realized that wasn't because of any lack of know-how."

John felt trickles of sweat running down his sides despite the growing chill in the air. "So what did he do?"

"He sneaked into his own starship. Spent all night using its computer, digging up records on the founding of Paladin. There wasn't any 'Boone' file, which was interesting because the ship's memory was supposed to duplicate *everything* contained in something called CORA."

"Cora?"

"Earth government's database—the government's information library. But he made an even more interesting discovery: there'd been a cache of files, numbered but not named, listed under the Paladin heading that had apparently been copied at one point, transferred to an isolated storage unit in London, England, and then erased from CORA. I don't know enough about computers to guess why they didn't erase memory of the transfer."

"And he figured this Boone file might be part of the cache?"

"You got it. He came to see me the next day. My Shooters were temporarily on . . . hiatus and I was living in an apartment near Buildem. I don't know how he found me so fast. But he saw right away how it was with me and I told him about . . . about what I'd lost. He thought it might be 'healthy' for me to get away for a while. So, he made me a proposition. He wanted to smuggle me to Earth,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

to England. I'd get a free look-see at the home planet, and while I was taking my mind off my troubles, I'd help Greg gain access to the secret cache. He'd figured out exactly where it was."

John was chewing on his lower lip. "Why did he need your help?"

"Because of the way automatic security systems are set up on Earth. Greg explained that there are so many goddamn security systems on good old Terra Infirma that at one point, most security personnel spent their entire working time dealing with false alarms."

"Not too efficient."

"So they finally started making those systems more . . . selective. If something looks like a man and smells like a man and sounds like a man, but happens to be running at thirty-eight miles an hour—it's not a man, despite all the evidence to the contrary."

"So you could go places normal people couldn't."

"That's right, son. And my DNA isn't *quite* human, and the gasses I exhale aren't quite the gasses a normal person would breathe out."

"Oh, Lord! No wonder they don't want slingers on Earth! I take it you succeeded?"

"You make it sound easy."

"And you read this 'Boone' file?"

"After Greg decoded it."

"So what's in it that's so important?"

"The bleeding truth, Tornado. And you're not going to like it."

Chapter 22

The sun was slowly drowning under the horizon but it wasn't increasing darkness that made William Caine's eyes look so bleak.

"They've been screwing us for more than a hundred years, son. They told us our planet was set up as a hothouse for biological science, right? And they claimed that by creating this bullshit cowboys-and-Indians society and then watching how it evolved, they hoped to get clues for squeezing some juice back into the dried-up people of Earth. But I'm here to tell you there's a *third* experiment happening here. And that's the one the authorities consider important."

"What is it?"

"It's you and me, son. Top slingers. Earth wants a new kind of warrior. Just in case."

John swallowed hard. "In case what?"

"Maybe someday we'll run into another space-faring species and they'll be as big a bunch of assholes as our own leaders. Maybe someday a colonized planet will attack Earth. Anything can happen and the military mind likes insurance."

"But why—"

"They've been directing us all along, manipulating us. Proctors and tourists aren't the only Earthlings around here. Agents live among us, steering our research in the direction Earth wants it to go."

"My God! I don't believe it!"

"I'll tell you something else you won't believe. On Earth, they have machines called 'weather probes,' satellites that keep watch for things like storms and earthquakes and bloody *tidal waves*."

John watched Caine's shiny plastic face and said nothing.

"People don't *have* to die the way they did in Strake." He'd spit out the last word as if it had gone rotten in his mouth. "And one of those hidden files that Greg and I recovered contained a real interesting nugget. Did you know that there are satellites orbiting Paladin right now?"

"No," John said slowly. "I didn't."

"Of course you didn't. Bloodshot eyes in the skies, painted dead black. Iota 1, 2, 3 . . . all the way to Iota 12. And they're not just for spying on us; they're also weather probes. The proctors like to know when a big hurricane or something is coming and see how we handle the *impact*. If we were allowed to use goddamn electronics like everyone else, we could save a shitload of lives every year. You understand me?"

"I'm afraid I'm beginning to."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"The ban on electronics isn't to preserve the so-called 'purity' of any so-called scientific experiment. It's to keep us ignorant and *controllable*."

"You're . . . sure about all this?"

"I'm sure. We've got to break out of the box they've nailed us into and I know just how to do it."

John shivered involuntarily. "How did you fake your death?"

"When I got back from Earth, I enlisted every Shooter I could trust and we cooked up an ambush that killed off every Shooter I couldn't trust. A few pre-arranged 'survivors' simply passed the word I was dead."

"You murdered your own men?"

Suddenly, Caine was on the verge of exploding, but then he visibly forced himself to speak calmly. "Tornado, you'd better start looking toward the greater good. We can't grab our own destiny by the balls without making . . . sacrifices. Don't you think it's worth it for the sake of our planet, for the sake of our *children*?"

"Right now, I'm confused. Don't you think most marshals would have followed you if you'd told them the score?"

"Shit no! You've got plenty of marshals too cowardly to take a chance of pissing off Earth, and others who were *loyal* to the monsters that set us up."

"And you needed a lot of blood to . . . lubricate your way to power."

"Look at it like that, if you want."

"But one thing doesn't make sense. How could Earth force slingers to fight its battles?"

"The Boone file didn't explain completely. But apparently we've all gone through a conditioning process that gives Earth some kind of handle on us."

"Really? When did this conditioning supposedly take place?"

"At Slinger School."

"Oh." John felt a cold shock as he remembered his peculiar dream about the school psychologist. Another relevant memory began to emerge, somehow connected with Dana, but Caine interrupted with a brusque chopping gesture with one hand.

"Enough! Go mull over everything I told you. Keep your end of the bargain and I'll keep mine and we'll meet in six more days. Then you're either with me or dead."

"I'll . . . I'll think it over."

"That's all I ask. By the way, since we're both here: as the challenged party, you get to pick our dueling site if it comes to that. And of course you also pick weapons and terms."

John nodded. "This ranch seems as good a place as any. And I'll have to go with guns." This was a terrible idea, but every other choice was worse.

"The format?"

"Hide-and-seek. Anything goes." The freedom should give John the best chance to make use of his two possible advantages over Caine: a certain talent for deviousness and the Kachina Cloak.

"All right. Six days and this is the place. If you're going to be stupid and fight me, don't forget to bring your second. I wouldn't want for this to be *unofficial*."

"I'll remember."

It was dark by the time John reached Sunstone. Paladin's smaller moon, Paco, was a pewter sliver in the eastern sky. Luckily, Indra's night vision was excellent. The bison had picked his way along without stumbling and with little guidance. Strangely, he seemed to already know where he was going.

John wished he could say the same about himself. He was the one stumbling blindly through an unexpectedly dark night of the soul, trying to forge a way out of the pitch-black morass Caine had thrown him into.

The outlaw had been right: John hated this truth. He felt as if it was stuck in his throat sideways and he could neither swallow nor spit it out. If Caine was right—and John had a terrible certainty that he was—so much of what everyone believed was a lie. . . .

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

He was dreading seeing everyone but Dana. If only he could park Indra in Chin Larker's barn quietly and not have to explain to a soul why he wasn't riding Houston. But Lilly had already been waiting far too long.

An aggressive southerly wind had arisen. Henri Jacques, unable to keep watch entirely by nose, was standing on a roof near the northern end of town. John gave him an all-clear signal and the giant nodded, hung from the roof by his hands for a second, and dropped to the street, landing with an eerie gentleness as if he carried his own brand of gravity. John braced himself. The huge veterinarian had always doted on Houston.

Indra slowed, sniffed the breeze, and snorted as the giant ran up; then, without instructions from John, stopped and waited patiently.

"Evening, Henri."

"Evening, Johnny. I'm glad you're back, you." Jacques was staring at Indra. His dark face was filled with urgent questions but he merely reached up to grasp John's upper arm and give it a gentle squeeze. "Our ladies, how they worry."

John was overwhelmed with gratitude at the man's sensitivity and restraint. "Lord, Henri, you're a better friend than I deserve."

"Is—is the big man all right?" Jacques asked softly.

"Our *ladies* worry? He's hurt, but he'll recover. I'll tell you everything later, but now I'd better find Lil. It's been . . . a bad Saturday, Henri, but it could have been worse."

The next five days were terrible and wonderful and held an incredible discovery. Sadness and gladness were as deeply intertwined as mating snakes and time refused to stand still.

Lilly Li had received the news of Joe's injury with real concern but this latest tale of her husband's strength and courage didn't surprise her. To John's vast relief she didn't ask permission to rush out to New Nokai Dome. She would wait for him, albeit impatiently, in Sunstone where she knew she was sorely needed.

With abundant grumbling, Barbara Gray replaced the damaged temporary skin on John's hands, but admitted that the tissue underneath was already "repairing itself despite your best efforts."

John and Dana spent as many hours together as possible and their already-strong connection strengthened. They shared old secrets and old pains. John talked about the forlorn aftermath of his brother's death, how withdrawn his parents became from each other and even from him. Some families draw closer with tragedy. In his case, each person felt exclusively responsible for what had happened. Guilt can drive a terrible wedge between people. It took decades for his family to partially reunite and full healing was never completed.

Dana, in turn, spoke of her failed marriage to her brilliant and disturbed ex-husband, Daryl, and how hard she'd worked to overcome her resulting suspicion of men. Her amazing calmness the night Caine's low-grade slingers had assaulted her in the saloon was a learned behavior. Daryl had always gotten far more violent if she showed how terrified she was and she'd promised herself that she'd never reveal such fear again.

To both John's and Dana's pleased surprise, they had much in common including similar tastes in food, art, and literature. They were both people who'd learned how to get things done despite self-doubt. With mixed emotions one evening, they admitted to each other that the bud of mutual attraction had already flowered into love.

For John, this love was increasingly painful because in his private heart he knew he was doomed. The Kachina Cloak couldn't render him *truly* invisible and Caine was a terror in battle, so inhumanly competent he would catch on to the ambiguous appearance of the disguise before John could use it effec-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tively.

After thinking a great deal about Caine, John had come to a disturbing conclusion: the outlaw had always possessed some kind of unique extra ability. There'd been too many signs of this in the past: the ease with which the man could read people, his super slinger accuracy in shooting contests, how he never seemed to lose his bearings. . . .

To make matters worse, John was sure that with the stakes so high, Dirty Jake wasn't about to play fair.

Dana had broken down when she'd learned that her Nokai Corral would be the dueling site. Because of her father's death, she associated the ranch with terrible loss. But when he stammeringly tried to explain that he'd chosen the Corral *because* of its connection with her, she waved his words away impatiently, telling him, between wracking sobs, that he didn't have to spell out the obvious. All he could do was hold her and stroke her bright hair until she calmed down. He tried not to show how angry he was at his own thoughtlessness.

Days flowed swiftly. All signs of the stupendous explosion were gradually erased. The few local citizens who had to work out of town went to work and returned, but never without a Dust Devil bodyguard.

John, accompanied by Dana, Chou Larker and family, every available Dust Devil, and a handful of townspeople placed a memorial plaque for Houston in the town graveyard. No one was buried in the graveyard—that wasn't the Paladin way—but the field had a surprisingly large collection of markers and cenotaphs for such a small town. Six of the markers looked quite new; Dirty Jake's campaign had cost Sunstone an emotional fortune.

Henri Jacques, his voice husky with grief and anger, conducted a small service and said a few heartfelt words about Houston, mostly thanking the zebra for having been such a good friend to John. Lo Pan showed up unexpectedly in the middle of the service, managed to delicately work his way through the crowd, picked up Lilly with one arm, and put the other comfortingly around both John and Dana who were huddled together in the cold.

That night, Dana put on a one-woman piano concert: Scarlatti, a rather ponderous sonata by Beethoven, one tune by some historical musical group with the unlikely name "Beatles." She finished with George Gershwin's "Rhapsody in Blue," a strange but oddly satisfying piece. John decided that if he survived the duel, he'd ask Dana for piano lessons.

With the hiatus from attacks by Dirty Jake, townspeople became relaxed enough to show their true and often petty colors. John was amused to learn that Sunstone had its share of deviant and obnoxious personalities. This revelation only endeared the town to him more, made Sunstone seem more real to him. If it weren't for his impending execution, he would have talked with his people about moving Dust Devil headquarters to Red Clay County. Maybe Dana would've been willing to lease the Nokai Corral. Caine had been right about one thing: the Corral would be a great place to settle down.

The Dust Devils conducted several long, private meetings, which proved frustrating and unproductive. John, keeping his word, said nothing about the cloak or what he'd learned from Caine. Yet, his people knew him well enough to guess that he was withholding important information. Tempers grew short. Henri Jacques became progressively more taciturn. Silver Davies shot off far too many snide comments. Lilly Li studied John as if he were a box she wanted to pry open.

It wouldn't be fair to say that nothing was accomplished. John described Caine's monsters in detail and shared all the information he had on their electronic accoutrements. Joe talked about

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

what it had been like to live for three days among the Anasazi. Kelly Walsh was officially inducted as a probationary member of the team. Jacques had taken both Walsh and Coby Patterson under his wing, as it were, and had been educating them on what he considered "righteous behavior" for a member of Tornado Carter's crew.

During a private moment, Walsh remarked to John, "That veterinarian of yours! He's a man and a half, he is. But he's a moody son of a bitch. And he acts like I'm some animal that needs training. The hell of it is, it seems to be working."

"He's angry at me and at himself, Kelly. He thinks I'm being stupid and he can't think of any way to help."

Days were passing; there was far too much to do, and fear was John's constant companion. He borrowed writing supplies and wrote down everything Caine had said about the Boone file. He put this in an envelope marked "to be opened if I'm permanently closed," signing his name beneath. He stuck the envelope beneath his clothes in the dresser drawer Dana had cleared out for him.

Silver Davies, Lilly Li, and he made a trip to the Nokai Corral and spent an afternoon scouting the terrain and discussing possible dueling strategies. But since neither Davies nor Li knew about the Kachina Cloak, their advice wasn't fully germane.

The one unblemished bright spot in John's life was the chief's gift. Indra made quite a splash when people got their first look at him and John felt his bond with this incredible animal tightening daily. While Dana was busy, he spent hours in long solitary rides. He talked out loud when he was sure no one was nearby, expressing feelings he didn't dare share with Dana for fear of pulling her into his own despair. Strangely, Indra seemed to understand him at times and this may not have been entirely fanciful.

Experimentally, he tried to guide the animal with words alone, asking him to go to such locations as "that big rock by the stream," or "that dead tree in the field." More often than not, Indra did exactly what he'd asked.

It became utterly clear that one of the surprises Shining Wing had promised was that this beast had far more than bestial intelligence. But attempts to open a direct dialog always failed (if you understand me, Indra, bob your head).

The white buffalo began to appear in his dreams as a shining symbol of hidden strength. Unfortunately, John didn't dream much because he didn't sleep much; he felt like a struck bell that couldn't quiet down. In waking life, he felt tired and weak, dragging himself from duty to duty with sheer willpower. Despite all the meetings, all the plans being hatched, the loving companionship, Indra, and the increasingly clear skies of fall, John was alone, stumbling in a moral darkness. Not only was he sure he was going to lose the upcoming duel, he wasn't even sure he had the *right* to win.

Dirty Jake had done terrible things and intended to continue. Yet, John understood him now. Earth's terrible grip on Paladin had to be loosened, and Caine evidently had a plan to do this. But John's soul cringed at the idea of *participating* in such brutality. Where was the yardstick that could measure these ends against such means?

The final day before the duel arrived.

John had reluctantly chosen Chou Larker to be his second. He didn't want to bring anyone at all, but Caine was within his rights to demand that all legal forms be followed. At least Larker, unlike any Dust Devils, would know he was too outclassed to think about revenge when John died. Larker would also be likely to leave the scene when John ordered him to. Lilly Li, for instance, would refuse to go until the duel was over, which would put her in more danger than he could bear.

The sheriff had agreed to go as if it

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

were an honor.

One way or another, Caine's truce would be ending soon and John realized that certain preparations were in order. After lunch with Dana (for him it had the poignancy of the last lunch they'd ever eat together), he squatted down next to Henri Jacques who was sitting on the sidewalk near the saloon, whittling as usual. The box he'd been working on was nearly finished.

"Henri," John said quietly. "If I die tomorrow, you're next in line to head the Dust Devils. Will you do that for me?"

The giant slowly swung his head around to stare grimly into John's eyes.

"You're not gonna die yet. But if your—your woman's *piano* chance to fall on your head sometime, and my turn do come, I pass over to Lil. She more senior than Dave, and she think quicker than the big man or me, eh?"

"I'll leave that up to you."

Jacques nodded. "Then the little one for sure. I'm no leader, me. I'm good at lifting things maybe and making my poems and carving and caring for our animals and sometime training them nice."

"And training people, I hear."

Jacques's white teeth gleamed momentarily in the cold sunlight. "You been talking to Kelly Walsh. Turn out as an *executioner* he fel' he had to be intimidating. Executioner, he don' want friends or he might have a . . . conflic' of interes' sometime, eh? Who would have believed Hangman'd be a good man beneath? Teaches me not to go around judging people all the time."

"I hope I've learned the same lesson, my friend. Henri, there's something I'd like you and Dave to get started on right away."

"Eh?"

"I want you two to set up two protected observation posts; one north of town and the other on Yue Liang Hill. Maybe we can borrow a few viewports again."

"We mus' do some serious digging then."

"I'm sure. Might even take chisel work at the hill just to break through the crust. But I'm worried that Caine might have some long-distance weapons and once the truce is over, he's going to start picking off our sentries."

Jacques nodded sharply, tucked box and tools away, and strode off to find Davies.

John visited Indra, spent an hour with the sheriff, and climbed down the banks of Cai Hong Creek where he found a quiet spot for his daily exercises. When he got back to the saloon, both Jacques and Davies were waiting for him, visibly excited.

"What is it?" he asked.

Davies shook his head. "You'd better come see for yourself, boss."

Two shovels, a big chisel and a mallet were lying near a two-by-four-foot shallow hole cut into the summit of Yue Liang Hill. Inside the hole, two feet down, was something strange and unexpected: a smooth unbroken surface of bright metal.

As everyone stared into the hole, Jacques commented, "Voila! You get yourself thinking you might know what's what, then bong!"

John knelt to get a closer look. "What do you make of this, Dave? Just what the hell is under here?"

"Maybe more diggin' should precede the guessin'?" Davies suggested dryly.

John glanced southwest to a small orchard where Kelly Walsh, as southern day-sentry, was keeping a sharp ear on the road. Walsh wasn't easy to spot among the branches. Distance made him look tiny.

If it wasn't for the money my parents spent on me, John thought, I wouldn't be able to see him at all. He was suddenly overwhelmed with gratitude. He'd seldom appreciated the quality of his own vision, but he couldn't imagine fully enjoying the world's beauty without seeing it in such crystalline precision. . . .

"Sorry, Kelly. We're going to be mak-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ing a racket for a while," John said in a conversational voice. Three seconds later, when Hangman shrugged acknowledgement, John added, "Hand me a shovel, somebody."

After half an hour of hard work, the trio had exposed another few feet of polished metal and John had developed a suspicion so fantastic he was almost afraid to share it.

But Davies was gazing at him intently. "Somethin' we should know about, boss? You should see your face!"

"Gentlemen," he said reluctantly, "I've just had a notion. But before I make a fool of myself and blurt it out, let's try an experiment. Dave, kindly make a small scratch in that metal."

Davies climbed into the hole, applied one corner of the chisel to the polished surface, and gave the chisel a gentle tap with the mallet. He rubbed out the slight scuff with a thumb, frowned at the unblemished material, and applied the mallet again, this time with zeal.

"Hard stuff," he remarked, holding the chisel up so that John could see that its edge had been bent over. "Does this prime your theory?"

"Yes. Let's sit down and discuss . . . mysteries. Kelly, I'll assume you're listening in from down there. Anyway, it's confession time."

"What is there to confess?" Jacques asked, seating himself and pulling out his nearly finished box and some fine files.

"On my way back from the Anasazi pueblo, I ran into William Caine." Jacques and Davies exchanged startled glances. "He was waiting for me at Dana's family ranch but he just wanted to talk. I got the impression he really wants my help. Apparently, he'd figured I'd sign up with him if he explained a few things and then gave me enough time to sort them out."

"What things?" Davies asked tensely.

"I can't give you specifics yet. I had to promise to hold his secrets until after the duel, but I've made sure that no matter what happens you'll know everything soon enough."

Davies closed his eyes momentarily as if in pain. "What a crock! Anything you can say . . . in general? If it wouldn't be too much damn trouble."

"I know how you feel, Dave, but I'm stuck. Look, he's uncovered one hell of a problem on Paladin and I have no doubt it has to be dealt with—I just can't see doing it his way. But he refused to answer some of my biggest questions."

Davies sighed and pulled his hat down to shade his eyes. "Such as?" Jacques laid down his tools to give John full attention.

"Here's one: what, exactly, brought Caine to Red Clay County?"

"What makes that an issue? With his transient routine, he had to go *somewhere*," Davies pointed out reasonably. "Why not here?"

"I think there's more to it, Dave. Give me five minutes and I'll write you a list as long as Henri's arm of better places for a large outlaw gang to be."

"Suppose you could at that."

"And I'm still wondering about those peculiar midnight . . . escapades where Mudslingers ride through Sunstone, shooting and shouting for no apparent reason."

Davies and Jacques both nodded.

"Wouldn't you two agree that Sunstone seems to be the real focal point of Caine's aggression?"

Davies looked thoughtful. "You could be right. I understand he's caused trouble in Aurado and Draw. But people tell me that most of his serious raids have taken place right over there on Main Street."

"Exactly. So I've been asking myself, why Sunstone? Karen Larker said that Caine is engaging in 'terrorism.' Maybe he's trying to scare people so badly, they'll move out of town. Or maybe he's just interested in keeping them indoors at night. In either case, what could he possibly want here?"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Jacques frowned at the hole. "You think that piece of steel give you an answer?"

John sighed inwardly. He couldn't explain how he'd jumped to such an incredible conclusion without breaking his promise. But if Earth needed slingers to fight its battles, it might need them on a moment's notice, and need them properly equipped. . . .

"I'm jumping onto thin ethical ice here. But what Bill told me implies that there might be a store of Earth-style weapons hidden somewhere on Paladin. Maybe Bill wants some privacy when he breaks into it."

Davies's eyes were round with astonishment. "Are you saying there's a pile of super-weapons hidden under this very hill?"

"I wouldn't put it quite that way myself," John answered slowly. "I don't think what we're sitting on is a hill, exactly."

Davies stared down at the hard-baked clay with uncertainty, touching it gently as if to test its reality. "Sure looks like a hill."

"That it does. See any other hills like it around here?"

"For God's sake, Johnny. What are you trying to tell us?"

"I believe Yue Liang Hill is a buried starship."

Half a minute of silence passed before Davies said in a hushed voice, "That's one wild idea all right, boss. Why would anyone want to bury a bubble-ship here?"

"Maybe because the clay in these parts has so much mercury-sulfate. It's a natural rust-inhibitor. Even an Earth alloy might rust if you buried it in normal soil and left it long enough."

"But Caine didn't actually *say* there's a ship here?"

"Hardly. But it fits everything he did say and it could explain why he's here. Also this might solve another mystery that's been bothering the hell out of me."

Jacques was almost glaring at the exposed metallic section. "You mean, those toys we found in the big drum?"

Now it was John's turn to stare and blink in astonishment. "Lord above, Henri! *That* idea hadn't even crossed my mind. But it works. Any reason, Dave, why those machine parts couldn't have been pulled from a bubble-ship?"

"None I know of. But even if we knew for sure they did, I'd still have no idea what they're for."

"I wouldn't expect you to."

Davies's eyes suddenly narrowed. "You know . . . if this *is* a bubble-ship and there's really a shitload of heavy-duty weapons inside—"

John nodded ruefully.

"—then this must be a *military* vessel."

"Yeah, but if I stretch my word of honor one inch farther it'll snap."

"Maybe you at leas' explain," Jacques demanded, "this other mystery bothering you?"

"All right. Have either of you asked anyone how Sunstone came up with so many viewports?"

Davies nodded while Jacques rolled his shoulders in an expressive gesture of disbelief unique to his native country. "Lying around in a shed someone say. Bah."

"I heard the same yarn," Davies said. "Are you suggesting there's a connection between your hypothetical buried starship and the viewports?"

"Why not? According to Chou Larker, a shed full of viewports and a good nearby water source convinced a bunch of pilgrims, including his grandfather, to build a town here."

"And you're not buying it?"

"Chou's grandfather told Chou that the drum was empty. I don't think we should take granddad's word for anything. Here's one idea: after the spaceship landed, everyone got out, stretched, and got to work building Sunstone. I have a little hunch granddad was

ACCESSED BY UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

in command."

Davies looked dubious. "That still wouldn't solve your mystery, boss. Why would a starship carry so many extra viewports?"

"What have we been using them for ourselves?"

"Oh. Shielding."

"There you go! You said it yourself, Dave: this has to be a military starship. I'll bet that somewhere inside this thing you'd find a collection of armored vehicles with missing windows. When the soldiers were building the town, the viewports must've have been too tempting to ignore. After all, they could always be bolted back in later."

Jacques thumped his hand on the ground with enough force to bounce his carved box off his leg. He caught it while it was still on the way up. "I don' like this. Why build a town here in the firs' place?"

"Don't ask me to elaborate, but I'm guessing that Earth wanted to make sure there'd be supplies and a potential crew nearby . . . in case the starship was ever needed."

Davies was shaking his head, his lips twisted in ironic admiration. "I don't suppose you can think of a way we can test any of this?"

"I'm afraid I can." John licked his lips. "Take that mallet and move down the hill a ways." Davies did as requested. "That's far enough. When I say 'go' give the hill a whack."

John climbed into the hole and put his ear against the cold metallic surface. "Go." After a few seconds, he stood up and announced in a very quiet voice, "It's huge and hollow. Draw your own conclusions, gentlemen. We're not putting up any barricade here. In fact, we'd better try like hell to erase all signs of digging. We don't want Caine to know we know."

"I'll get right on that," Davies said crisply. "Some water, a few buckets of clay and this hill will soon be looking good as . . . old."

"Let's hope so. And try to think of another way to protect our sentries."

"You go on ahead, Dave, and I catch up soon," said Jacques. When the smaller man had moved out of earshot, the giant held out his carving project for John to inspect.

"It's lovely, Henri, but—"

"When I get this done and polished up real good, I'm giving her over to you."

"Well, thank you. It's beautiful."

"It's as good as I can make, Johnny. Mos' times that's as much as anyone can do, no?"

"I can't imagine anyone doing a better job on—"

"Ah, mon frère. The thing about you is you're differen'. You always do better than you can do. That's why I do what you say. That's why I joined up with you and stay joined up. It's something of why I love you. And—you remember what we talked about this morning?—it's why I don' think we gonna be looking for another *leader* just yet."

Chapter 23

Next morning, John slipped out of the warm bed he shared with Dana long before the sun was up. He did some easy limbering up exercises. During a slow set of single-arm handstand-pushups, he brooded about the way Paladin's first colonists had chopped up time.

Paladin's year is shorter than Earth's and its day is shorter too, by almost eight-tenths of an hour. Those early settlers, wanting things as familiar as possible, opted for a 24-hour day and the traditional sixty minutes to the hour. They insisted on standard-length seconds. To make things work out neatly they simply stole two seconds off every minute, declaring this solution precise enough for an imprecise society.

A Paladin minute, therefore, has only fifty-eight seconds. This had never bothered John before. But now, irrationally, he felt cheated, as if all the extra sec-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

onds had been accumulating in some cosmic storehouse and he'd never be allowed to get his share.

Today, he had to duel William Caine.

It seemed he'd been born into this world an infinitesimally short instant ago, and in another such instant, he'd be forced out of it. He wasn't ready.

He looked over at Dana to find her clear eyes wide open, watching him. Her natural optimism had been flagging lately and dark shadows underscored her eyes like premonitions of grief.

From some deep chamber of spirit, John pulled forth an encouraging smile. "I promise you, darling, I'll give it everything I've got."

"I wish you could promise more."

"So do I. But I—I have a secret weapon I can't talk about, not even to you, because of a promise I made. Maybe that will make the difference."

Now Dana managed to smile back and her face seemed both sad and luminous. "I'm glad you told me at least that much, my love. I'll be praying it's a *good* weapon."

Me too, John thought. He opened the curtains slightly and gazed down at the street. To his dismay, three Dust Devils were gazing back at him. Silver Davies and Lilly Li were huddling close together and Lo Pan Li was placing a thick blanket around their shoulders. Joe himself never seemed to feel the cold.

But John did. Today a chill was wrapped around his heart. Davies and Lilly were mad at him and Lilly especially was insistent on accompanying him to this final confrontation. That he had refused her for her own protection only made her angrier.

Where's Henri? John wondered. Probably on sentry duty somewhere, or he'd be lurking out there too.

"I wish I could be with you today," Dana said quietly from behind him in an unconscious echo to the demand in Lilly's eyes. Dana's voice was husky and John couldn't even guess what it was costing her to maintain control.

"I wish you could too, Dana. Lord, how I wish it! But worrying about your safety would divide my attention. I'm going to need to pay *close* attention this morning."

"Won't you worry about Chou?"

"Sure, but I've told him to get the hell out of there just as soon as we've finished the preliminaries."

"Will he do that?"

"He'd better. I was . . . definite on that point."

"This is—never mind. I know you have to leave soon, can I at least fix you breakfast?"

"Thanks, darling. But I never eat right before battle." He stopped himself from adding "because of possible abdominal wounds."

"There must be *something* I can do for you."

"Definitely. I'll need to bring water and maybe fruit juice. Carrots for Indra, too, if you can spare some?"

By the time John had washed up, gotten dressed and put his weapons on (including the Lumbar Luger), and slapped his pockets to make sure his supply of Kachina Cloak hadn't slipped out, Dana had readied sealed containers of water, cantaloupe juice, and carrots. She threw on some clothes and the couple hurried outside together.

Henri Jacques, with Kelly Walsh striding beside him, was just leading Indra up the street. John had shared with Jacques everything he'd learned about caring for the bison. The veterinarian was the only person in Sunstone, aside from John, that Indra took seriously.

Now, the only person missing from John's unique entourage was Coby Patterson. John felt oddly apprehensive about this; he'd been sure Coby would show up. The one-armed man had become fanatically loyal to the Dust Devils and he'd made himself surprisingly useful. Even Jacques had been impressed with Patterson's easy skill with such diverse animals.

Indra snorted his welcoming snort.

ARCHIVED UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Hope you don' mind me bringing the bull out for you," Jacques remarked, keeping his voice low to avoid waking sleepers in nearby homes. "He's all fed and watered up and I oil his hooves real nice."

"Thanks, Henri. You saved me a heap of time. I can . . . take it easy on the way there."

"We'll talk when you come back. Be quick today, you. Hear?"

"I hear."

Jacques sat down on the sidewalk with a studied casualness as if John's returning was so certain that he didn't even need to say farewell.

Walsh, on the other hand, stared intensely into John's eyes. His white skin seemed even more pallid than usual in the cold false dawn and his wide lips looked waxy. "Are you absolutely *sure*, Marshal," he asked in his harsh voice, "that you won't change your mind about me giving you a hand? Remember, I haven't had my own chance yet to let Jake know what I think of him."

John tried to look confident. The Dust Devils couldn't afford to lose any extra members today. "If there was another way, Kelly, I'd take it. But I appreciate the offer. And I haven't forgotten what brought you to Sunstone."

Walsh shrugged unhappily and his pale eyes filled with a cold fire. "I think you're making a mistake. You're in charge, but it looks to me like everyone here has a lot to lose if anything . . . goes wrong."

"I'll be as careful as I can. Lord above! Sun's almost up; I'd better get moving." He looked around at his friends with bitter regret that he couldn't allow any of them to accompany him on the road, not even for the first few miles. Mudslingers could be watching; Shining Wing had warned him that "video equipment" can be mounted anywhere and John was afraid to send the wrong message.

Silver Davies silently started to shake John's hand but then left the blanket he was sharing with Lilly to pull him into an embrace. Next, Lilly stood on tiptoe, kissed him on the lips, and whispered in an aggrieved tone, "Damn you, Johnny. You know I should be going with."

"Tell you what, Lil," he whispered back. "Next time, I'll send the rest of you and I'll stay here, how about that?" When he pulled back and looked down, her eyes were brimming.

Lo Pan rubbed his wife's back tenderly and surreptitiously sniffed the air.

"Trouble, Joe?" John asked tiredly. The giant was calm but he held his healing shoulder as if it ached.

"Would you care for a tiny suggestion, Mr. Tornado?"

"From you? You know I would."

"Work backwards."

"What do you mean?"

The giant sighed ruefully. "Just . . . work backwards. That's all I know about it."

"All right. I'll remember. Will you . . . watch over everyone and make sure they don't do anything . . . rash?"

"Discard such worries, friend of friends, and walk lightly in the moment."

"I'll remember that too." John hugged Lo Pan—he couldn't get his arms very far around the man—and then turned to Dana. "Dana, my darling, my whole life I've been—" was all he could say before his voice froze up.

"I understand. I do understand," she replied giving him a teary smile with her entire heart in it. "Come back safe."

John still couldn't talk; so he nodded and tried to express how he felt about her with his eyes alone. He placed his supplies into Indra's saddlebags, reluctantly vaulted into the saddle, and then gave the reins a mere twitch. The white buffalo sprang northward and was in full gallop before anyone could say another word.

Sheriff Larker was waiting on the road near his cottage, mounted up and ready to travel. But Indra had to slow to what seemed like a crawl before Larker's ex-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ceptionally fast antelope could keep up.

By the time they reached the Nokai Corral, golden-red sunlight was blasting the upper slopes of mountains to the west. A faint mist captured the light, spreading a pastel blush across the land, somehow making John think of sunset on some primeval, uninhabited world rather than dawn on Paladin.

He was grateful for the warmth radiating up from Indra's broad back. The air held a chill that cut like a knife.

He and Larker had arrived before Caine. John was grateful for that. He desperately needed more thinking time, time to find a way out of his moral quagmire. Days ago, Larker had asked if good ends could ever justify bad means and John hadn't had an answer. What, precisely, was wrong with sacrificing a few individuals in order to save so many more? Wasn't it, in fact, *necessary*?

The sheriff, sensing John's mood, had said little during the journey and was gazing around speculatively at the abandoned ranch. Occasionally he'd catch the marshal's eye and attempt to counterfeit a smile.

All John knew for sure was that when you boiled away everything else, one fact remained: he couldn't join Dirty Jake's gang. He didn't feel this was a noble decision or necessarily the right one. It was simply the only one he could live—or die—with. But how could he try his hardest to win this duel, half-convinced he was in the wrong?

Far too soon, Caine came bounding from the west on his "rootile," Glinda. Riding beside him was Boke, that odd and aloof slinger who seemed to have no last name, no feelings, and who dressed only in black. After one contemptuous snort, Indra ignored the newcomers. John noticed how carefully the malevolent kangaroo kept its distance.

Caine wasted no time. "You with me, Tornado?"

"Afraid not."

"Well . . . that's a damn shame." Caine's face was set hard as concrete, but a spark of sympathy may have flickered in the depths of his cobalt-blue eyes. "You don't sound all-fired happy about your choice, son."

"Doesn't matter, Bill, that's where I stand."

"Very well. So the next step is we go through the ritual and then we all inspect the dueling arena." He sat up straighter in his saddle. "My name is . . . Dirty Jake. My second here is Mr. Boke," he stated formally.

"I'm Grand Marshal John Carter and my second is Sheriff of Sunstone, Chou Larker."

Boke flicked his reins. His steed, an oversized black lion, eyed Indra nervously and reluctantly edged forward a few feet. "As the challenged party, Marshal, you have choice of weapons and mode." Boke's voice was a low-pitched, quiet monotone. "How say you?"

"I say guns, free-for-all, and hide-and-seek with a five minute lead."

"Is the lead time agreeable, Mr. Jake?"

"It is."

Boke barely nodded. "Then I declare terms set. Everyone dismount. Sheriff Larker and I will lead the inspection."

Inspection was more than a formality. It was conducted to insure that a duel was as fair as possible, that no traps, ambushes, or land mines had been hidden in the dueling arena. The ranch was extensive, and it took an hour just to investigate the perimeter and the long-unplowed fields. Under different circumstances, John might have become bored, but not today. To him, everything seemed *heightened*; every rock and blade of volunteer grass exuded a strong, distinct personality.

No one had found anything amiss so far, but John mistrusted the apparent honesty of this contest. Caine could have an army not far off, waiting for a signal.

As the four men approached the house for the final phase of inspection,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

John heard a faint metallic click. Instantly, all three slingers were diving for cover. John pulled Larker down too. After so long a period of quiet, the rifle blast an instant later was shocking.

John's awareness jumped an octave; the air suddenly seemed a clear fluid that reduced all movements to leisurely ballet. He didn't draw his guns; Caine and Boke would be listening for that and might use it as an excuse to attack him, two slingers against one.

The Mudslingers had no such fears. They were on the ground, rolling fast, constantly changing directions, firing repeatedly. Sometimes their guns were right side up, sometimes not, but they were always pointed at one particular window in the old ranch house. That window had been slightly open on the bottom, but Mudslinger bullets shattered the glass and burst its frame to splinters.

As if in a slow-motion scene from one of the corny, antique movies occasionally shown in Buildem, a one-armed man fell from the window. His body flipped over loosely in mid-air to smash backfirst into the porch roof below, and then, leaving behind a crimson slick of blood, he gradually slid off that roof to lie still on the frozen ground below.

"Anyone know the corpse?" Caine demanded calmly as he was picking up his hat. The body looked strangely small, as if only life had kept it properly inflated.

Larker was deathly pale himself. "I do," he whispered. "His name was Coby Patterson."

John felt sick. What had Coby been *thinking*? But he knew the sad truth: Patterson had been trying to rescue his new hero the only way he knew how.

Some hero I am, John told himself bitterly. I've failed Coby completely. The young fool must have been waiting in that house, alone, through most of the night. And he can't have truly believed his plan would work. . . .

John had more than his own grief and guilt to deal with. Larker's anguish was a second emotional bullet hitting John's heart. The sheriff slowly walked to the body and John followed. There was no doubt Patterson was dead; his chest and neck were thoroughly blasted apart.

But here, finally, was the answer John desperately needed and he was mortified that it had taken the death of a friend for him to see it. It had been obvious all along, self-evident in the faces of people like Coby, Handy Ernie, Dana Ryder, Shining Wing, Karen Mueller, Barbara Gray. . . .

Everyone is important, he told himself. A person's value isn't a quantifiable quality like height or weight. It can't be placed on a scale and balanced against some higher good. Also, pain is an individual experience. Suffering doesn't . . . aggregate, collecting in some vast reservoir like rainwater. One person's suffering can't be compared to another's or to the suffering of multitudes. Moreover, how can anyone judge what the loss of any human being means to the world, what the consequences will be for their friends and families? Sacrificing individuals for the sake of a greater number of individuals isn't automatically the right thing to do. It's a moral shot in utter darkness.

Tornado's mind had accelerated into battle mode, racing to encompass the range of his growing comprehension. As if from increased momentum, his thoughts veered in a new and broader direction. . . .

There are times when people have to defend themselves or die. And innocent lives are always lost in war. But Earth wasn't actually attacking Paladin. Caine was the one trying to start a war. True, Earth's manipulations were onerous and their proctors were offensive, but suddenly John could understand the terrestrial point of view. If he were responsible for the entire human race, wouldn't he consider developing a special breed of warriors in the event of some future external threat? Had the results of this breeding program been so terrible?

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Couldn't there be a way to sabotage the program without bloodshed?

The business of withholding crucial weather information was another matter entirely. But there had to be a better answer to that wrong than Caine's. How the hell, he asked himself, can you build a stable, positive society on a foundation of fear and loss?

As the marshal stared down at Coby's face, his thoughts returned to the immediate and personal. John had been seeking a yardstick to measure ends against means. Now he understood that the impossibility of making such measurements *was* that yardstick. In the end, he could only go by his individual sense of what was fitting, what felt balanced. Right now, the agony in Chou Larker's eyes was the only guide he needed.

"Damn it, John," the sheriff groaned. "I can't believe it. I just can't believe it! I was there when Coby was born! For years, he was so damn *miserable*. Then thanks to you and Henri, the boy was finally pulling himself together."

John put his hand on Larker's shoulder. "I know. He was doing great."

"He was happy. And *now* look at him." Larker stood, turned his back deliberately on the two outlaws, and gazed directly into John's topaz eyes. "Tell me something, Tornado Carter. Can you win this damn thing or not?"

"I don't know, Chou. But I'm going to try."

This time he meant it.

Chapter 24

During a duel, protocol demanded that everything else be put aside until the duel was over. Patterson's body was left where it was while the four men finished the inspection and walked back to the Corral's main entrance. John went over to where Indra was tied to the fence, removed his hat, and dropped it into one of the big saddlebags.

Boke waited for everyone's attention then held up a black-gloved hand. "I declare the field of honor clean and clear. Do I hear dispute?" When no one spoke, he continued. "I hear no dispute. This duel may commence. May the best slinger win."

Caine and Boke exchanged a glance and the black-clad slinger was already backing away as he completely the final formality. "Your five minute lead starts *now*, Marshal. I'll close these gates to keep the animals out should they manage to unhitch themselves."

A closed gate was supposed to keep out a *lion*? John thought, wondering what Boke was up to. But the outlaw's face, as always, revealed nothing.

"Waiting for breakfast, Carter?" Boke asked indifferently. "I'd get moving if I were you."

John made a peremptory gesture at Larker, silently ordering the sheriff to get on his antelope and ride away. Larker nodded understandingly but ran up first to give John a hug.

"Buddha's infinite love be with you, buddy. Be damn careful—never test the depth of a river with both feet. That's an Ashanti proverb. I'll be back to pick up Cody's body, and I'd purely hate to be picking up yours as well!"

John wasted a few seconds watching Larker swing into his saddle. Then he turned around and bowed respectfully to Caine who was staring at him curiously. After Caine bowed back, John took off, sprinting north toward an area of rough terrain at the back of the property.

From behind came the sounds of Larker riding southeast, which pleased John. But he also heard the gates close, then the flutter-flutter padding of a giant lion moving west in one hell of a hurry. Where, he worried, was Boke going?

Two hundred yards past the house, the land sloped sharply downward toward some large empty pastures where it flattened out again. As soon as John was beyond Caine's line of sight, he abandoned the road and took to running, like a man on a tightrope, on the narrow topsoil-retaining wall edging the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

nearest pasture. Even Caine couldn't follow nonexistent footprints.

Ahead was a modified-apple orchard whose trees needed pruning. He made a twenty-five foot leap from the retaining wall to a low, sturdy tree branch. From there, he jumped to the next tree, repeating the maneuver until he'd come to the orchard's far end. With a grand final leap, he landed on ground too hard and rocky to leave tracks.

Three minutes had passed of his allotted five. He hastily fished the jar from his pocket and stared at the double lid, feeling a squeeze of panic because, at this urgent moment, he couldn't remember Shining Wing's instructions. He took a deep breath and it all came back to him.

He pried off the white lid with twitching fingers. Inside was a thick liquid with a briny reek. Bending forward, he reached around to hold the jar upside down over his back and felt wetness, still warm from his pocket, soak through his jacket and shirt.

He straightened up, resealed the container to preserve the dregs, and waited the required thirty seconds. Then he removed the black lid to find another kind of liquid. Holding his breath for more than one reason, he poured the foul-smelling stuff directly on top of his head.

More wetness soaked his hair and flowed unpleasantly over his face. Suddenly the world appeared tinted as if he were looking through a slightly dirty window. His hearing was unaffected. He wondered what was keeping the cloak from entering his nostrils. Perhaps he didn't *have* to hold his breath.

He should've asked Shining Wing more questions while he'd had the chance!

A transformation was slowly sweeping down his clothes in an uneven ring. Watching his body gradually become something so visually strange and uncertain was . . . unsettling. How would Caine react to the sight of him now? John had the sinking feeling the outlaw would take it in stride, instantly grasping the true nature of Indian Scouts. Shining Wing was taking his own risk here. John replaced the black lid, put the jar back in his pocket, and waited nervously.

When the change reached the top of his boots, he remembered to jump high enough for the liquid to cover his boot-soles. Now the cloak was supposedly complete. Hurriedly, he put an eerie-looking hand near a rock as a test. Nothing happened. Then he recalled the chief explaining that the "eye" of the cloak would be on his back, and the "eye" controlled the appearance of the rest.

He wished there was time for more experiments. Instead, he sprinted towards a long line of boulders near the back of the property. Dana's father had been killed falling off one of those rocks. John was unhappily certain that his own story would have a similar ending.

During inspection, John had chosen the place for his last stand: a flat, narrow shelf of rock stuck tightly between giant boulders acting as walls on three sides. The shelf faced south, was high enough to give a good view of the land directly ahead and up the hill, and was well protected except for its open side. Without John's secret weapon, anyone walking down the hill would've been able to spot him instantly. But the titanic, upthrust rock directly behind the narrow nook was highly textured with ragged diagonal striations of weather-stained calcite. In such a spot, the cloak might render him virtually invisible.

The hideout had two disadvantages. His field of vision would be limited, blocked off by the boulders to either side. And he wouldn't be able to make a quick escape if gunfire pinned him in. Perhaps, however, he could make a slow escape; the boulders were close enough at the bottom to provide a climbable chimney. Higher up, they began to separate but there, the tall western boulder had sufficient handholds.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

In less than the remaining minute before Caine was theoretically allowed to come after him, John was ensconced in his lair. His trained inclination was to lie flat and make himself the smallest possible target, but then the cloak wouldn't come into play. So he sat cross-legged with his back near the calcite wall and tried to ignore the way his body suddenly looked like a bad mineral specimen. He drew and cocked his guns, which now resembled pistol-shaped chunks of calcite, and tuned his hearing to its ultimate sensitivity.

There were any number of sounds: little clicks as cold stone grudgingly adjusted to changing temperature, ghostly whistles from gusts of wind seining through gaps between boulders, muted grunts and growls from the two animals still tied near the Coral's distant entrance. He heard nothing resembling the stealthy approach of an enemy. The fishy odor of John's disguise had abated. He tried not to think about whether or not he'd actually be able to shoot his old friend and mentor when it came down to it.

He waited, he listened—the rising sun cast stretched-out blue shadows pointing accusingly westward. The world seemed wrapped in a frozen moment as if nothing could ever change.

This peaceful illusion shattered when he felt more than heard the first faint, irregular thuds. At first, the noises seemed to be emanating from miles away. Somewhere, perhaps, Anasazi were beating out gossip on one of their ground-drums. But as the sounds intensified, John knew better. Several massive animals were bounding toward the Corral from the west. The wave of fear that swept over him left him dizzy, with a throat too dry for swallowing.

He didn't know if he was more upset by the prospect of facing giant monsters again, or by Caine's willingness to cheat so outrageously. John was furious at himself for being foolish enough to feel betrayed. Apparently, he hadn't been paying attention lately and *still* had a reservoir of trust for his former friend.

Who was he to complain? Wasn't he doing some high-end cheating of his own?

At least he'd made one good decision. If he'd followed normal slinger tactics and tried to sneak around behind Caine to gain the superior position, he'd be out in the open right now with the cloak doing little to disguise the fact. If anything, the shifting colors and amorphous appearance would've been sure to attract extra interest. If the monsters were again acting as Dirty Jake's remote eyes, he'd have been spotted instantly and it wouldn't take brilliance to deduce his identity.

As it was, he was tucked into a small, shadowed space with the cloak working to perfection. The rootiles wouldn't be able to see him.

But when the two towering animals had cleared the western fence and began leaping east across the hill above John's hiding place, they came to a stop, sniffing and tasting the air, gradually turning until they were facing John's ledge. Glassy tubes, glistening in the early morning sunlight, covered their eyes.

I've had nightmares more fun than this, John thought grimly. How the hell do they know I'm here? Are those damn video-equipment eyes of theirs better than the natural kind?

Maybe they could see his body heat or something. Now he had a big problem. If someone was monitoring the scene through the monsters' "lenses," they too might be able to detect him. That hardly mattered. Caine merely had to notice how his pets were keeping their ugly snouts turned toward one particular spot. John couldn't shoot the beasts without revealing his position.

For a moment, the wind jibbed and was blowing towards him. The stench was worse than he remembered and, despite the tactical disadvantage, he was grateful when the air resumed its southern journey.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Both monsters leaned forward, tails up, lips snarled back to expose five-inch fangs. John's tasted sourness deep in his throat. His plans were dead and he was out of choices. It was pointless to wish things were different; they were as they were. Lo Pan's advice, "Walk lightly in the moment," returned to him as he aimed and braced himself . . .

An explosive snapping sound in the distance startled him within a split-hair of firing prematurely, its echoes drowned out by a peculiar throbbing rumble. This might have been thunder, except that it kept getting louder until the air was quivering and the ground quaking. Then the white buffalo appeared, charging down the hill, his pounding hooves mere flashing blurs. Thunder indeed; Indra seemed as fast and bright as a bolt of lightning! Apparently, John hadn't seen his buffalo in an actual hurry before.

The sight was undeniably thrilling, but John's strongest reaction was a terrible new fear. "Go back!" he yelled. He couldn't bear it if Indra went the way of Houston. . . .

One of the monsters jumped clear, but the other lifted a leg challengingly, extending its formidable claws. Indra put on an extra burst of impossible speed, lowered his head, and thrust the length of his horn into the rootile's chest. The collision of shaggy head with scaly body produced a thud so tremendous, John felt three distinct aftershocks.

He couldn't believe what happened next. Indra lifted his head sharply and a dead multi-ton monster went flying over the bison's back. It hit the ground with a stomach-turning crunch of bones and snapping of ligaments. Indra wheeled and ran toward his remaining adversary. That rootile glanced at the juggernaut headed its way and took off, leaping eastward with hysterical sincerity.

Badly worried about his steed, John risked his own safety by leaning far out from his hiding place to see past the boulder to his left. To his great relief, the white buffalo had only pursued the monster long enough to drive it off and was standing a mere hundred yards away. Rootiles weren't necessarily the most dangerous enemies around. In no hurry, Indra circled back to the hillside directly in front of John's refuge and stood upwind of the dead beast, panting like some colossal dog after a long summer run. From his dark nostrils and mouth flowed the smoke of hot breath on a cold day. For a magical moment, Indra seemed an amalgam of mystic beasts: unicorn and dragon, with perhaps a touch of Babe, Paul Bunyan's blue ox, thrown in.

John stared in genuine awe. Right now, he felt that if the bison suddenly sprouted wings and flew off, it wouldn't surprise him at all.

Fabulous beast or not, he urgently wanted Indra to be elsewhere. Obviously, this was a duel without rules and Caine might decide the buffalo was too dangerous to ignore. Certainly, the Anasazi hadn't made their pet *bullet-proof*.

"Go away, Indra," he whispered harshly, backing up far enough to once again resemble a bulge in the cliff. "Get back to the road."

The animal had his own agenda. As the panting slowed, Indra began turning his head from side to side, the opal eyes throwing out momentary gleams of fire.

Damn it! John thought. He's looking for me. Thanks to the cloak, he can't actually see me, but he knew I was here even before I said anything. The Anasazi must have given him some ability to detect their Scouts. What the hell am I supposed to do?

The one bright spot was that the Mudslingers—and John didn't doubt Caine had human allies on the scene—might not dare shoot the bison quite yet for fear of revealing their own positions.

Indra snorted with what sounded like disgust and took to nibbling the hillside's green volunteer grass. This was

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

normal enough, except that Indra kept bobbing his head as he chewed, quite unlike his usual eating routine.

John's eyes narrowed. Every time the bison snatched up a new clump of grass, his horn would swing back to one specific position before he began chewing. Then the bobbing would resume.

Suspicion crystallized into jaw-dropping certainly. There was no doubt about it: Indra was trying to tell him something. John's steed was apparently a *pointer* bison!

If the pointing was accurate, he guessed that Caine or one of his crew was on the other side of the tallest rock, the one to John's right. And if it were *dead* accurate, the Mudslinger was just beginning to climb. . . .

John nodded thoughtfully. A reasonably lightweight top slinger could easily jump from the top of the western boulder to the summit of the shorter one across the way. It was a lengthy jump and there'd be plenty of time to send enough bullets flying downward to end the game.

John watched his buffalo carefully. Indra's head was tilted back further now. Carefully and silently, John put one of his guns in its holster, shifted his weight, and pointed the remaining Colt nearly straight up.

Something black flashed past the top edge of the western boulder and darted back out of sight. John kept very still. He'd thought someone might want to test the waters before diving in. . . .

There was a long, long moment of silence. Then a black-clad man was above him, jumping horizontally as if he were flying, aiming two black-enameled guns at the ledge below.

Boke didn't have a chance. Forewarned by Indra, John was already in the perfect position. He fanned his pistol's hammer and shot four rounds. Two bullets went through the outlaw's heart and the other two knocked the black guns aside; John didn't care to be killed by a dead man's reflexes.

He heard a faint thump as Boke's corpse landed on the eastern boulder's rounded top, a hissing as it slid downward, and felt only the tiniest jar as the body hit the hard ground below.

Indra had moved uphill a few yards, perhaps startled by the gunshots. To John's disappointment he didn't run away, but merely resumed his grass-nibbling duties. And his head began bobbing again.

How many pieces are *on* this chessboard? John wondered darkly. An unpleasant vision of William Caine scaling the rock behind him crossed his mind, but Indra seemed to be indicating a spot well to the east.

Twice now, John had carefully studied the ranch terrain and he called up a mental map, hoping to deduce exactly where this new enemy was and why they'd chosen to be there.

He remembered a tall, flat-topped natural pillar in the right general vicinity. But the location seemed strategically idiotic unless . . .

John hastily broke off a sizable chunk of calcite from the rock wall behind him. This took surprisingly little strength and made very little noise; the chunk must've been about ready to fall out on its own. He worked by feel because he didn't dare stop looking upwards. If he caught a glimpse of something falling towards him, he would have to abandon his post and *fast*.

Keeping his face turned skywards, he quickly estimated the proper angle and trajectory. With a silent prayer, he bent down to get a little extra room and took two practice swings. Then, throwing underhand, he tossed the rock up with tremendous force. It whistled as it left his hand.

In order for the stone to clear the eastern boulder and yet land where it should land, he'd had to put his full strength into the throw. But maximum effort and maximum accuracy seldom walk hand in hand and John couldn't be sure his visualizations were precise

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

enough in the first place.

He waited, kept lookout, and tried to ignore a developing crick in his neck. After awhile, he wondered if the rock was going to bother coming down at all.

He heard a distant dull thud and a choked-off grunt. John blinked in surprise and felt an icy touch of strangeness; he hadn't expected the rock to actually *hit* anyone. He'd only been hoping to scare this enemy into moving farther away, thus preventing the Mudslinger from hurling anything—especially something deadlier than a rock—at John for a bit longer.

The explosion, even though John had been thinking about nothing *but* dynamite for some time now, startled him badly. Perhaps someone had been holding a lit stick when the rock fell. Small pieces of debris rained down into the nook and John wondered, queasily, how many of these pieces had recently been part of a human body, and whose body they'd belonged to.

That last question was answered a moment later when a scarlet hat landed at John's feet. A genuine-looking feather was tucked into the hatband. Both hat and feather were in perfect condition.

John winced and shook his head. Ringo Romanie, master of knives, had always claimed his hat decoration was a genuine eagle feather brought from Earth by his great-grandfather; but John had pored over books about terrestrial birds and he suspected the "eagle" involved had been black and had made cawing sounds.

Today was proving a bad day for legendary slingers.

He glanced over at Indra who seemed agitated but otherwise unaffected. The bright white back was dusty and spotted with small pieces of detritus. Indra was no longer pointing at anything. That *could* mean nobody else was around yet, but there were other possibilities.

John turned his head toward the wall behind him and a mental image of Bill Caine stealthily climbing up from behind became much too vivid.

"Come here, Indra," John said softly. The bison obeyed instantly, trotting over to stand close to John's ledge.

Moving swiftly while looking up and back every few seconds, John pulled off one of the saddlebags. Then he tugged on his steed's side until Indra brought his head around. The bison's breath smelled of sweet grass in the enclosed space.

"Twice now, my friend," John whispered, "you've saved my life. But it's time for you to leave. Go wait for me by the front gates. Will you obey?"

These instructions should've been far too abstract for even this bovine genius, and perhaps it was only coincidence, but Indra shook his shaggy beard, stamped a hoof, and bounded up the hill, leaping neatly over the dead monster.

The world seemed a much lonelier place when John could no longer see him.

Chapter 25

Hurrying now, John applied the dregs in his cloak jar to the saddlebag using Shining Wing's procedure. Soon, it looked like a sack-shaped object from some other reality.

He stuffed its straps into the hole once occupied by that rock he'd thrown, and wedged them in tightly with the empty jar. Now the bag was hanging, wall-irregularities pushing it slightly away from the surface. It blended into the wall fairly well, but not perfectly. Its contour looked wrong.

Thanks to the rootiles' electronic eyes, the Mudslingers probably knew what John looked like wearing his cloak; or at least what he looked like standing near this particular wall. So, he hoped that if Caine did, in fact, climb in from the north, he'd glance down and see the bag, mistake it for one Tornado Carter, waste a bullet, and give away his position. It was worth trying.

John planned to be elsewhere as soon

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

as possible. He took a deep breath and leaned out from the ledge far enough to snatch a peek in both directions. He drew his other gun. In this uncertain situation, the ability to shoot in two directions at once could be more important than being able to shoot quickly. He let himself drop softly to the ground where he sat very still, listening. As far as ears could tell, he had the Corral to himself.

Earlier, he'd noticed another spot on the property that held strategic promise. He hadn't chosen to make his stand there because it wasn't as protected as the nook. This second choice was a gully—really a dry streambed lined with semi-polished rocks, the larger ones out to the sides. A good-sized stream flowed through the Corral's lower half and John guessed its course had been artificially altered, leaving the gully to dry up.

The gully's best feature was a good view of the surrounding area. John would know if anyone were approaching. But to get there, he was going to have to take a fearful risk.

He took one more cautious look around and then started running northwest, moving as swiftly and quietly as possible. Some crunching was unavoidable, too many pebbles underfoot. He kept feeling a cold spot in the center of his back as if a small, icy target was affixed. Ten yards ahead, the ground changed from sandy ocher to the typical reddish county hue.

He felt slightly safer when he reached that point. There were only two places enemies could be nearby yet hidden from where he was now standing: either in the gully ahead or else behind the nest of boulders he'd recently abandoned. He wasn't overly concerned with either possibility. With so many pebbles, John would've heard anyone approaching the gully or sneaking around inside it. The looming bulk of the closest boulder, the one Boke had climbed, was protecting John just by being there.

The angles were now in his favor. Not even William Caine could stand on either of the two smaller boulders and jump high enough to shoot sharply downward past the taller one. Leaping directly to the western slab was out of the question; the closest summits were twenty-five feet apart with a fifteen-foot height difference. Of course, Caine could very well be scaling the western boulder from the far side. . . .

John was almost to the gully before he realized the flaw in his thinking.

Without warning, Caine was in midair, a good twenty feet above the tallest rock. He was wearing his silvery vest and a distinct blue aura. How could John have forgotten about the *vest*?

Readiness is everything in a crisis and the marshal wasn't ready. In a twisted echo of what had happened to Boke, Caine's first two shots sent John's guns flying. The next shot punched through the fleshy part of his left thigh. Remarkable marksmanship considering that the outlaw's target was a moving, vague blob of eerily shifting colors.

John did the only thing he could. He jumped backwards, flipped in midair, and landed on his one good leg at the gully's deepest point. The impact was brutal—something snapped inside his right knee. He collapsed helplessly, winding up with his back against the cold embankment.

Even a slinger has limitations. Within the space of two seconds, he'd become nearly incapacitated: both wrists were sprained from having his guns knocked violently out of his hands and his left index finger was broken and bleeding. His left leg was ominously numb and he was losing blood fast.

Unfortunately, these things were the least of his troubles.

His cloak was gone. Shining Wing had warned him that too much salt would kill the delicate cells. Evidently, blood could also do the trick.

Assumptions! he thought bitterly. I *assumed* Caine wouldn't be able to leap that high. Joe warned me to walk lightly

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

in the moment—and there I was, trudging around wearing lead boots.

But maybe he didn't have to throw away Joe's *other* piece of advice. John was in a nearly hopeless position. His choices had shrunk to the point where Joe's suggestion, "work backwards," made a horrible kind of sense. This duel was over except for the dying, but with luck, he might be able to stop Dirty Jake from killing anyone else.

Working as quickly as possible with injured hands, he reached under his jacket to loosen the straps to his .25 caliber secret weapon, his "flat-cannon." He flipped the device over so that its two short barrels were pointing directly at his back. It was uncomfortable worn this way, but comfort was hardly relevant.

He desperately wished he could have simply worn it on his stomach pointed outwards, but Caine would spot such a telltale bulge in an instant. . . .

John leaned back, felt where the gun pressed against him, and then made a small adjustment in its position. In the extremely unlikely event that he wasn't about to commit messy suicide, he didn't want a bullet severing his spine. Hoping that the weight of his leg was putting sufficient pressure on the exit wound in his thigh, he pressed his left palm against the entrance wound, rested his right hand on the buckle of his gun-belt, and waited, sitting in a widening pool of his own warm blood.

William Caine seemed to be in no rush to finish the job and John had more time than he really appreciated to think. He thought about Dana. He thought about his Dust Devils. He thought about bullets.

He'd already be dead from hydrostatic shock if Caine used softer bullets; that was interesting to contemplate.

And the .25 center-fire cartridges in the Lumbar-Luger were solid, hardened brass with a Spitzer, almost needle-tipped shape. They'd penetrate practically anything, but they wouldn't spread. John tried to find a speck of hope in that fact.

Shrewd as always, William Caine jumped into the gully thirty feet away from where John was lying. From there, Caine looked his victim over carefully from head to foot. When he was sure that the marshal had no weapons or even a rock ready to hurl, he slowly approached, keeping one Colt aimed at the center of John's chest.

When the outlaw got close, John was shocked to see tears streaking the man's cheeks.

"How'd you do it, son?"

"The . . . disguise?"

"Shit, no. Give me a little credit, for God's sake. I've been on Earth; I've seen the technology those bastards have available. I'm surprised you'd do something so illegal, but you obviously got hold of some fancy terrestrial camouflage."

"I won't deny it." Apparently, the Anasazi secret was still safe.

Caine used his free hand to wipe his eyes, one at a time. "What I meant was, how'd you train that new animal of yours so fast? I saw it in action."

"Did you?"

"You know I did. And even when your boy killed my rootile, its *cameras* were still running."

"Oh. I hadn't realized."

"That stunt with the bag was entertaining. Same stuff you used on yourself, I imagine. Something chemical?"

John a tiny shrugging motion. "You could say that. Well . . . to answer your first question, Indra doesn't seem to need much training."

Caine sighed. "I should've killed that damn buffalo right away, but I just couldn't bring myself to do it. At least I had a choice there, even if it cost me. Damn you, Tornado. Why did you have to make me do this to you?"

"Listen to me, Bill. What you're doing is wrong. You can't—there isn't a good enough reason in the universe to kill innocent people."

"I'm afraid there is. I hate it myself,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

but it's necessary. Every single day on Paladin, lives are lost because of stupid, cruel rules we're all forced to follow. What's *your* plan to fix things?"

"I don't have one. But I'm willing to look. There's got to be a better way."

Caine sat down opposite John, fresh tears rolling down the leathery cheeks, the gun held rock-steady. "I guess this is it. God, I feel bad about shooting you, never expected things to come to this. But we've all got to face facts eventually. Any last request?"

"You already heard it: find another way to reach your goals. I'll back you up if you do." John turned his body very slightly.

"Sorry, but that's not going to happen. I'll never forgive myself for this, but . . . farewell. You were a good—"

John gathered the shreds of his courage and squeezed his belt buckle in the three required places. There was a muffled snap and Caine was thrown backwards against the embankment, blood spraying from two neat holes bracketing his breastbone.

For a bizarre second or two, John felt fine. Then his vision blackened. A powerful, invisible hand had suddenly reached into his belly and pulled out his internal organs. He passed out, not for long, and when he reopened his eyes, his entire body felt cold, wet, and frighteningly hollow. He hugged his arms tightly over his two new abdominal wounds.

Caine, incredibly, was alive. The cobalt eyes slowly opened and he gazed at John with an almost childlike amazement. He chuckled very quietly a few times. Blood began to trickle from the sides of his mouth and he coughed, swallowed, and cleared his throat.

"John the Conqueror, eh?" His voice was a tiny thing. "Should've known you had something up your . . . sleeve. Hell, you've always been a little smarter than I expect. Jesus! I'm looking right at you and I don't even see the bleeding *gun*."

John was having trouble breathing. He took his air in short gasps and stared at Caine's pistol, which had fallen within an inch of the outlaw's hand.

"Don't fret, son, no point in killing you now. Quite the contrary. Besides, shooting you won't save *me*."

"How bad does it hurt?"

"Can't feel much below my chin."

"I'm real . . . sorry about this, Bill. You don't know how . . . badly I wish things . . . were different."

"Yeah. Got a regret surplus myself. But now everything's going to rest on your shoulders."

"*My* shoulders?" Belatedly, the marshal understood. Caine didn't realize they were both dying. The outlaw must have thought all the blood was either his or from John's wounded leg. He didn't seem to notice how John was struggling for every breath.

"You heard me! Here's *my* last wish: I want you to finish the job I started." The outlaw gathered strength for a moment. "Snatch our planet from Earth's grip. Hell, maybe you'll find some decent way of doing it, some way I wasn't smart enough to think of. I sure as hell hope so. But you sure as shit won't be able to do it without getting your knuckles bloody, son. Get the job *done*, that's all I ask."

Out of compassion, John said, "I'll try."

"The Mudslingers are yours now. They'll do what you want. And they'll fill you in about what I had in mind."

"Why would they . . . do those things?"

"Jesus, Tornado! That's a stupid question to ask a dying man! Because I told them to if you won. Why else? But there's something important you ought to know right away. There's a starship buried—"

"Under Yue Liang hill."

Caine's lips twisted. "You're full of surprises today. Believe me, you're going to need that ship."

"You expect me . . . to fly a starship?"

"Hell, no. That part's taken care of.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

And maybe you'll get a little surprise yourself before long."

For a minute neither man spoke. The air was warming and the sun was high enough to paint a line of fire on the western rim of the gully.

"Still with me, Bill?" John asked quietly.

Caine's reply was a hoarse whisper. "For now. You tell me something. What in hell made all that screeching that day in Sunstone?"

"A cornet. A kind of trumpet."

"You're joking."

"Not a *good* cornet."

"That, I can believe. Remember how the damn thing made that one long God-awful squeak? It got inside my head and whirled around until I couldn't think."

John blinked in surprise. "Right! The same thing . . . happened to me. You don't suppose . . ."

"Talk faster. I'm feeling a little tired."

"You told me . . . that Earth . . . has conditioned us somehow. Maybe they plan to control us . . . with certain sounds. Maybe—"

Caine's body suddenly went horribly rigid for a second, shuddered violently, then slumped with the total relaxation of death.

John studied the outlaw's face and felt something akin to a sneeze coming on. He braced himself to hold it in, but what actually came was a sense of loss so intense and far-reaching that he began sobbing. Each sob sent spasms of agony through his punctured belly, yet he couldn't stop. He cried like a man saying goodbye to everything he loved, unsure of whether his tears were mostly for Caine, or Dana, or Houston, or his friends, or for himself.

The light of the world seemed to be dimming now, and John's grief was dimming with it. He closed his eyes and let himself float away into an immeasurably vast emptiness that, at the last moment, seemed filled with a new kind of brightness.

* * *

Chapter 26

Dana Langhorn Rider wasn't a person who believed in hiding from the truth, no matter how painful it might be.

Yet, as she walked north along Main Street, she had to concentrate to keep her back straight and her stride steady. Before she'd reached River Boulevard, Henri Jacques was by her side. Jacques's face looked as hard as something carved from polished obsidian, but he reached out and held Dana's hand with great tenderness as they walked along.

Lilly Li watched the pair approach and tried to smile at them. The resulting expression looked so stricken that Dana had to swallow repeatedly to force her heart back down where it belonged.

"Any change?" Dana called out to Lilly when they were close enough.

The delicate-looking slinger lowered her head. "Nothing as yet." She closed her mouth as if she refused to say another word. But then words forced themselves out. "And it's been three days!"

"I know. I'm—we're on our way to see him again, see how he's . . . doing."

Lilly looked so forlorn that Dana reached over with her free hand and tugged gently on the slinger's arm, silently inviting her to accompany them. Lilly didn't resist.

"Hard Nose" Rose and six Mudslingers were standing on the sidewalk in front of the Sunstone Bakery having a quiet discussion. For the last two days, they'd been returning stolen items to Sunstone. An unofficial truce had sprung up between Dirty Jake's men and the Dust Devils. Two of the Mudslingers were big, muscular brutes, but when Henri Jacques got within ten feet, they squeezed themselves against the bakery wall to give the giant plenty of elbow-room. Jacques walked past them as if they weren't there.

Lo Pan Li was waiting near the infirmary, his gentle gaze focused on its closed door. He walked over to his wife and put his arm around her protectively.

"This one day," he announced in a

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

faintly embarrassed voice, "I have been wishing I was less big. But Dave is inside and he is kind enough to come out often and report."

"They should have made the infirmary bigger," Lilly responded loyally.

"Tell you what, Joe," Dana volunteered. "When we go in I'll ask Barbara if we can leave the door slightly ajar. I know you'd like to see him."

Lo Pan shook his head sadly. "It will get cold inside."

"Just a crack and we won't leave it open for long."

The room was crowded, but Dana's attention went straight to the man lying flat on his back in the infirmary bed, eyes closed, barely breathing.

Tornado Carter was dreaming. In this dream, he was floating horizontally above a mighty ocean looking into the water. He must have had the eyes of a god because he could see straight down for thousands of feet, but not all the way to the mucky floor. He knew this ocean had a mucky floor because it was teeming with life, and oceans teeming with life always have mucky floors. In fact, this was obviously one of the legendary seven seas of Earth. He knew *that* because the sea contained squids, all sorts of squids. You don't find squids anywhere but Earth, he told himself, smugly pleased at making such a clever deduction.

But as he stared downwards, he began to feel uneasy. Toward the water's surface were tiny squids, so small they might have been invisible to his normal eyesight. A little deeper the animals were bigger, inches in length.

And the farther from the surface they swam, the bigger they were. A hundred feet down, some specimens were twenty feet long. Then, somewhat lower, they were at least thirty. Far below those, a . . . flock of *Architeuthidae*, eighty-foot long monsters, glided backwards with languorous ease. And deeper still were abysmal shadowy figures that dwarfed the giant squids. And even deeper than that . . .

Suddenly, the vision seemed a diamond-clear metaphor for all the challenges in his life. "Well, hell," John drawled to himself. "I guess there's always a bigger squid somewhere."

Now the tiny ones near the surface were getting noisy, producing an annoying hissing that made it hard to stay properly relaxed. John opened his eyes.

"He's waking up," Dr. Barbara Gray said briskly. "Looks like that ridiculous rattle did the trick."

John's vision was a blur. He blinked several times and was startled to find so many people surrounding him when the room sprang into focus. Dana was smiling at him brightly. Her hands were trembling but her eyes were luminous. Lilly Li, Henri Jacques, and Silver Davies were beaming at him with such identical expressions, the three of them looked strangely like siblings. The door was ajar and a slice of Lo Pan Li's moon-size face was visible through the gap. He could guess at Joe's expression from the pleasure in his one visible eye. John tried to smile back at his friends, but his facial muscles were apparently still sleeping.

Tubes were attached to various parts of his body but only his back was hurting. He felt as if he'd been lying in one position for a year.

Dr. Rachael Bloom stood at the foot of his bed, holding a metal sculpture resembling a Tibetan dorje. It looked like two curved crowns glued bottom to bottom. She nodded approvingly at John and shook the device. The resulting sound was, in fact, the squid-noise that had awoken him.

"My medicine rattle may have played its part, Marshal," she said in her careful way, "but what saved your life, in my judgment, was your parents. They must have been prescient."

"How so?" John's voice came out creaky and soft.

"You must know that your internal or-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

gans are arranged . . . differently than most people's?"

John nodded, and the room seemed to spin. No sudden head movements, he told himself sternly. "My parents figured that a good shooter would aim for the wrong spots."

"Smart."

"Up until now, it's given me nothing but indigestion."

Barbara Gray interrupted gruffly. "Looked to me when I first saw you, as if you shot *yourself*."

"Actually, I shot through myself."

"I don't think I much care for that notion. Did you know you were aiming for those 'wrong spots'?"

"I hoped so but I couldn't be sure. How—how did I get back here?"

There was a moment of silence. Then Dana stepped forward, took John's hand as carefully as if it might break and kissed his bandaged finger.

"You may find this hard to believe, darling," she said softly. "Dave and Henri and Lilly were heading out to the Corral after a . . . reasonable amount of time had passed, but Indra passed them going the other way. He was carrying you by your gun-belt."

"Carrying me? How?"

"With his horn. I told you it was hard to believe."

"After what I saw this morning, nothing that bison does could surprise me."

"*This* morning? Johnny, you've been lying there for three *days*. The doctors patched you up fast enough. But you didn't wake up and they were afraid that—you never would. Everybody, except poor Joe who can't squeeze through the door, has been in here to visit you often. Chou was here this whole morning. He told me you were going to be waking up soon! And Mr. Walsh and Shining Wing were in here yesterday and—"

"Three days? Lord above! What's the current . . . situation?"

Dana looked over at Dr. Gray who merely nodded her head slightly. She turned back to John. "Are you sure you're feeling strong enough to keep talking, darling?"

"Feeling better by the minute. I'm even getting hungry. I suppose I'll be eating through a tube for awhile, Doctors?"

"Don't see why you should," Barbara Gray snapped. "Unless you *like* eating through tubes. Rachael and I may not be your big city physicians, Marshal, but we know something about medicine."

"Sorry," John said, a little abashed that his ability to smile should return just when he would have preferred to look serious. "Fill me in, Dana. I'd love to know what's been happening while I was on vacation." On the word "love," he gave her hand a gentle squeeze.

John stayed in the infirmary another five days. By that time, much had been settled.

He'd broached the subject of relocating Dust Devil headquarters to the vicinity of Sunstone. Everyone on his staff approved the idea. Staying close to the buried starship seemed important. He wasn't the only marshal to become attached to the people here. He hoped his personnel in Wyatt wouldn't find moving too great a hardship, but when they'd signed on, they'd agreed to live wherever the core group thought best.

John called for a Dust Devil war council and invited Dana and Chou Larker to attend; Lo Pan had to participate through the infirmary's opened door.

John told the group about the Boone file and everything else he'd learned from Caine. After people had calmed down—which took a rather loud hour—the group made a pact to honor Dirty Jake's last request and alter Paladin's planned destiny. Almost everyone seemed certain that Tornado Carter would find an honorable way to do this. Tornado Carter was the one exception; he wished he could share their confidence.

When John finally got out of bed, he

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

felt as if someone had turned up the local gravity. He lied smoothly, claiming that he was now ready for anything. The walk from infirmary to saloon seemed a thousand miles long.

John sat in a saloon chair, sipping root beer, getting his breath back and enjoying a private moment with Dana, their first in over a week. Dana again expressed her enthusiasm about leasing her Nokai Corral to the Dust Devils. She told John, however, that if he wanted to keep living with her, it would have to be in the room above her saloon. She felt that she needed to stay on top of her business to stay on top of her business.

Now that Caine's ambushes had ended, John had no problem with the implied long-term commitment. But he pretended that the choice was fearfully difficult. For a while, Dana watched his act with a faint smile and hooded eyes. Finally, she went into the back room and returned with a certain cornet. She held it to her lips, and John lifted his hand in quick surrender, conceding that he really did want to keep living with her.

Coby Patterson's funeral ceremony was held the following morning; it had been delayed in hopes that John would be able to attend. Henri Jacques talked about Coby's life and what a triumph it added up to. He talked about redemption, calling it, "that sweet oil which spread from wherever it be applied to a person's whole lifetime."

Caine's final surprise for John happened that afternoon.

"Hard Nose" Rose was visiting John, who was resting in the saloon. He reminded the marshal for the tenth time that the Mudslingers remained at John's command. He also said that the gang had "cleaned house," expelling or even killing members whose crimes were "particularly repugnant." He mentioned offhandedly that he'd personally appreciate it if Tornado Carter would grant the surviving outlaws a blanket amnesty.

The iron-tough old marshal wasn't apologetic about the atrocities Dirty Jake's gang had committed, but he made it clear that the course William Caine had charted wasn't Rose's idea of a virtuous path. He'd only followed it because he'd sworn allegiance to Caine who seemed the only person in a position to free the planet.

"I'm a pragmatist, Carter," Rose announced. "Always have been. Now, you're the best hope we've got. So we're all waitin' on your word."

John replied that for now, the Mudslingers should find honest work. They could begin by dividing themselves into teams. Each team would replace one of the agencies they themselves had destroyed.

He explained that crime fighting was the secondary goal here. "We've got to keep the proctors fooled long enough to set our plans in motion."

"Damn straight. What are our plans?"

"I haven't gotten that far yet. Maybe it's high time you gave me the details about *Caine's* plans."

"You're the head chef, boy."

Rose started talking. Even if Caine had survived, his attacks against the agencies had nearly ended; he needed a certain number of slingers alive and cooperative to wage war. The Mudslingers had only twenty "unswayable" marshals left to dispose of. Tornado Carter was the final name on the list.

With the marshals so reduced, Caine's next step would've been to unleash a plague of rootiles on the populace, far too many for the remaining marshals to handle.

An interesting tidbit: Caine had once been close enough to the Paladin Apaches to make a shrewd guess as to the nature of Indian Scouts. The rootiles' special optical equipment, which had been smuggled in from Earth, had been designed, in part, to counter Scout invisibility.

As John had thought, Caine had intended to force the inhabitants of Paladin to create a secret government with

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

him in command. His new government would then assemble a secret army of normals and low-level slingers.

Only a well-organized worldwide conspiracy could hide such an army from Earth. Caine had wanted the conspiracy as much as he'd wanted the army. His plans required a population that could act as a unit, quickly and decisively.

The army's purpose would have been threefold: creating the impression that the private agencies were functioning normally, preventing proctors from leaving Paladin if the deception failed, and keeping law and order when every living top slinger was . . . elsewhere.

"Where exactly is 'elsewhere'?" John asked quietly.

Rose tilted his head back slyly. "Orbiting Earth. You'll have to ask your pilot if you want those details."

"What pilot? Where can I find this pilot?"

Rose broke into a wide grin. "Right about now, he's standing behind you."

John turned his head. Aside from the two slingers, the only people in the saloon were Dana who was dusting the piano, and Gil Kleib the bartender, busy polishing the counter.

John stared hard for a second. "Gil?"

"What can I do for you, sir?"

"Know anything about starships?"

"Quite a bit, actually." Gil's tone had shifted way down to a pleasant baritone and the British accent was thicker. The man's face relaxed into a startling smile. "I was afraid Mr. Walsh would give me away prematurely; he and I have spent some time together. With those ears of his, I thought he might identify my voice no matter how I altered it. Couldn't have any proctors getting wind of my real name, don't you know! Ah, John. I'll wager you *still* don't recognize me."

"Lord above! Dana, dear?" She'd stopped dusting and was gazing at the bartender as if she'd never seen him. John waved a hand expansively. "I'd like to introduce you to an old friend of mine, Captain Sir Gregory Tormuelson. Looks like Bill Caine wasn't the only believer in plastic surgery."

Tormuelson was happy to reveal his personal history. He'd returned to Paladin as a tourist after he and Caine had cracked the file whose code name was "Richard Boone." But too many proctors would have recognized him. So, he'd disguised himself with surgery, an artificially high voice, and a deadpan expression and moved to Sunstone, where he knew his skills would eventually be needed.

He explained how dependent Earth had become on its manned space stations and communication satellites. He talked about Caine's plot to quickly seize control of the entire system and use the system and any surviving space station personnel as hostages. He talked about drone missiles, guidance systems, and lasers. John listened to all of it intently.

When the man finished, John raised his palm. "Thanks, Greg. I'll need you to repeat all this again later, probably more times than you'd like, but I've got enough now to start making intelligent plans."

"I take it you're not going to follow Bill's exact blueprint?"

John smiled. "I think we can come up with something less bloody than a frontal assault. One idea springs to mind already. Bill mentioned that Earth's security systems have trouble keeping track of slingers."

"True, that's how we—"

"So we might be able to sneak in the back door. I'll work something out. But what I don't know is how the hell we're supposed to get that starship out of the hill."

"That part's simple, really. That's what all the electronic junk you found in the big drum is for. I'll show you when the time comes. And to ease your mind: our vehicle may be old, but it's scarcely a typical colony ship of the period. For one thing, it's well armed. For another, it's comparatively fast."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"I hope so. Greg, it's great to see you again . . . and know it. Still, it bothers me that you'd been working with Caine all along."

"I imagine. Let's understand each other. I believed in Caine's purpose, John, I still do. But I have to admit to feeling better with you handling the matter. At least I kept the Mudslingers from getting even uglier when they were in town. Will you hold my old loyalty against me?"

"I'll try not to."

"Good. Then it's back to the bar for me. My boss is a stern taskmistress!"

Dana just shook her head disbelievingly.

John turned to Shelly Rose. "Another thing I'd like you Mudslingers to consider: paying reparations to all the people you've hurt over the years—or their survivors." Rose nodded sharply as if accepting an order from a superior officer and hurried out of the saloon.

John had a lot to mull over. There was much to do, and some need for haste. Tormuelson's information could become dated, so John had to get things moving faster than he wanted to. He hadn't exactly forgiven the Mudslingers; but from what Tormuelson had said about Earth's weapon systems, the Dust Devils were going to need all the help they could get.

He stared blindly at the tabletop and considered the immediate future. . . .

First priority was getting all his Wyatt people—ten slingers and fifteen support-staff members—to Red Clay County. This was going to be a chore. And since he wanted to explain the move personally to everyone waiting at headquarters, John himself would have to go to Wyatt. But not alone. He'd take Silver Davies along. No one, not even the Mudslingers, knew what had become of the rootile that Indra had chased off. It'd be pleasant to have good company on the road—and far safer. Between the two of them, they'd get everything organized for the move in no time.

* * *

He and Davies planned to start out early the next morning. John awoke feeling a strange and unfamiliar emotion. He tried to put his finger on it all through his breakfast with Dana, but he only figured it out after he gave her a goodbye kiss that might have to last for more than two weeks.

The challenges ahead were by far the biggest . . . squids yet, but he was content. He'd never been *content* before. And little by little, a plan was beginning to congeal. . . .

Dana, Lilly, Joe, Henri, Kelly Walsh, and Chou Larker watched the two slingers mount up in the early morning light and trot off. Both men turned in their saddles to wave farewell. Then Indra glanced over at Davies's golden tiger, snorted, and set a pace that made the great cat growl while it strained to keep up.

"Slow that locomotive *down*," Davies laughed.

"I'll try, but this damn buffalo has a mind of his own. You'd better start feeding that pussycat of yours more vitamins, Dave."

Standing in the street with her friends, Dana smiled to herself and gazed at John's quickly receding back. Just as he and Davies reached the end of town, the first shaft of dawn light suddenly turned the eastern side of Yue Liang Hill incandescent.

Dana blinked at the resulting illusion. What a perfect symbol for bright hope after a dark time, she thought. She took a mental photograph of the scene and tucked it away securely into her private heart. No matter what happened from here on, *this* was something she wanted to remember. Tornado Carter and Silver Davies were heading northeast and Mebsuta hadn't truly risen yet. But from where she was watching, it looked as if the slingers were riding off into a golden sunrise. ■

ACCESSED ON UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

THE REFERENCE LIBRARY Tom Easton

Defender, C.J. Cherryh, DAW, $6.99, 452 pp. (ISBN: 0-7564-0020-1).

Explorer, C.J. Cherryh, DAW, $23.95, 408 pp. (ISBN: 0-7564-0086-4).

Barnburner, Sharon Lee, SRM Publisher (P.O. Box 179, Unity, ME 04988), $16.00, 224 pp. (ISBN: 0-9722473-0-0).

Down and Out in the Magic Kingdom, Cory Doctorow, TOR, $22.95, 206 pp. (ISBN: 0-765-30436-8).

Touchless, Russell Davis, Wildside, $32.95, 220 pp. (ISBN: 1-59224-987-6).

Mapping Mars: Science, Imagination, and the Birth of a World, Oliver Morton, Picador USA, $30.00, 357 + x pp. (ISBN: 0-312-24551-3).

TechTV's Catalog of Tomorrow, Andrew Zolli, ed., QUE, $29.99, 288 + xvi pp. (ISBN: 0-7897-2810-9).

Bradbury: An Illustrated Life: A Journey to Far Metaphor, Jerry Weist, William Morrow, $34.95, 195 + xxvi pp. (ISBN: 0-06-001182-3).

The Hard SF Renaissance, David G. Hartwell and Kathryn Cramer, eds., TOR, $29.95, 960 pp. (ISBN: 0-312-87635-1).

Once upon a time, in a galaxy far, far away, the starship *Phoenix*, laden with the builders and residents of a planned space station, met disaster. Lost in space, they found a hospitable star and built a station, Alpha, in orbit above a world whose humanoid natives, the atevi, had a technology roughly equivalent to nineteenth century Europe or America. The ship was run by the autocratic and xenophobic Pilot's Guild, which insisted that Station Alpha would be home. Many of the Stationers, however, thought the world below looked enticing. They rebelled and landed. The ship and its crew departed to seek a way back to Earth's homely environs.

It took two centuries for the humans to learn to get along with the atevi, for their hard-wired responses to each other and their world were very different. By the time C.J. Cherryh discovered them, Bren Cameron was the "paidhi," whose job was to interpret humans to atevi and atevi to humans. It was a high-stress job, complicated by the hard-wiring differences and two brands of political maneuverings to boot.

Meanwhile, the ship built another station, Reunion, near a sun with no bothersome natives or tempting greenery. Unfortunately, they somehow angered an unknown alien people, who blasted the station. When the *Phoenix* returned from a journey to discover this, it high-tailed it back to Alpha. Fortunately, the far-sighted Captain Ramirez had already begun training two youngsters toward readiness to serve as ambassadors to colonists and atevi. That helped when the ship appeared in atevi skies and began to demand fuel and assistance to ward off a potential attack by the aliens who—says *Phoenix*—left that other station a lifeless hulk.

Alas, neither the human colonists nor the atevi had space travel yet. Not much help there—but the atevi catch on fast, and it wasn't long before the station was

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

being repaired, fuel was being produced, and the *Phoenix* could anticipate being ready to deal with the unknown threat.

That much took four volumes—*Foreigner*, *Invader*, *Inheritor*, and *Precursor*. Now we have **Defender** and **Explorer**, and since I am covering them together, be warned that I will surely reveal too much about *Defender*. As it begins, the *Phoenix* has been fueled, the construction of the atevi's own starship is under way, Bren Cameron is fending off family crises back in the colony, the atevi overlord Tabini is putting on a political dog-and-pony show for which Bren must come down from the station (and immediately return), and Captain Ramirez, as he lies dying, leaks the word—where a crewman can hear—that people remain on Reunion station.

Now there is no choice: *Phoenix* must return to Reunion and try to rescue the people it left behind a decade ago. After suitable confusion, Bren receives new orders from Tabini, as well as a new rank: He will go with the ship as the "Lord of the Heavens," carrying the atevi to new realms. Worse yet, Tabini's decidedly forbidding grandmother, Ilisidi, will come too, and she will bring Tabini's young heir as well. Both Bren and Ilisidi will, of course, have their very powerful and competent security staff with them.

Not much really happens. This is a talky 'tween novel, loaded with Bren's introspections. A placeholder that exists to lead into the next novel, it fails utterly to stand alone. Politics plays large, as well as the layers of lies that the *Phoenix*'s captains have told their own crew, the colonists, and the atevi. Bren must find his way to truth, preferably before the ship embarks. And Jase, one of those two youths Ramirez once prepared as negotiators, must learn to function as a captain, junior to the prickly and unforthcoming Captain Sabin.

The action picks up with *Explorer*. As *Phoenix* approaches Reunion, it becomes clear that the Pilot's Guild is still in charge. What's worse, it expects *Phoenix* to put itself back in its one-time subservient position and follow orders despite long separation and obvious—to Bren!—independence. The Guild means it too, for there is a sign on the fuel lines, warning *Phoenix* not to touch without authorization, or a bomb will blow. Worse yet, new damage to the station is apparent and an alien ship is lurking in the distance.

It doesn't take Bren long to exchange a few intelligible messages with the alien ship. No one seems to have thought of trying before, but Bren is a skilled translator of very different cultures. And now he knows: Reunion has an alien prisoner. Soon Reunion also has *Phoenix*'s senior captain, Sabin, who has gone ashore with most of the ship's security force and promptly gone silent. Prisoner? Or dead?

And Bren, official (by atevi lights) lord of all the heavens, and Grandmother Ilisidi have their household troops ready to . . .

I really should stop telling all, shouldn't I? Not that I've covered everything—there's loads of detail a précis can't touch!—but still . . .

If you've enjoyed the earlier titles in the series, even if you agree that *Defender* is rather too much of a placeholder 'tween book, you'll love this one. It does a very fine job of capping the series to date, while opening up loads of room for a few more volumes. (Will she write them? Who knows? But Cherryh does have a record of long series.)

Sharon Lee and Steve Miller are well known for their Liaden Universe series, but Sharon also writes on her own. For an example, look at **Barnburner**, a mystery set in Maine in that dusty, musty time when "going online" meant dialing up a bulletin board service. Remember when? Just ten years ago?

The narrator, Jen Pierce, has come to Maine from Baltimore (just as did Sharon

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

and Steve) to live in the house left by her late aunt and work for a small local paper. Her world is now rusty pickups and winter, beans and cider, laconic locals and back-to-the-landers who are—honest to goddess!—witches. This provokes a local preacher with a history of raving over such things as abortion clinics into a fine fit of frothing at the mouth. But the neighbors rally 'round and are helping Wiccans Merry and Scott with their barn-raising—until the preacher winds up dead. Scott, of course, is trotted off to jail as the one with the motive, and Jen must collect the clues and lead the tale to a quite satisfactory conclusion.

If "regional" fiction is defined by being strong on local setting and local color, then Steve King is a regional writer. So is Sharon Lee, and wouldn't she be delighted if this novel sold as well as any of King's? It probably won't, but Liaden fans will buy it and be pleased with another side of one of their favorite writers. Others will discover a charming story marked by wry humor and a fondness for the Yankee way.

Do you know what "augmented reality" is? It's not virtual reality, for you see the same old world around you. But it's annotated. Add that to a world where technology has created wealth enough for all, without any need for actual money. Well, not quite. Nobody works for pay, but everyone earns "whuffie"—credibility or reputation points—according to how much people value their words, thoughts, or deeds. No whuffie? You get a very basic ration and wait forever in the priority queue for anything better. Got lots of whuffie? Jump to the head of the queue and help yourself.

Waiting forever sounds rough, but since people are immortal, they just have to be patient. Not that no one dies—but you can backup your memories and have them downloaded into a new body at need.

Not much new there, even if TOR does blurb it as "cutting edge speculation." The world of science fiction has seen every bit of it before. But Cory Doctorow puts an entertaining spin on it with **Down and Out in the Magic Kingdom**. No one needs to work, but there's still that whuffie carrot, so people form ad-hoc groups (Doctorow's world is run by the "ad-hocracy") and take on projects such as running Disney World in Orlando. That's the setting, where century-old Jules, who has learned ten languages and written three symphonies, has moved in. His girlfriend was born to the Disney ad-hoc, and he has joined the effort. That's when an old friend—his whuffie exhausted—shows up to get ready for his suicide and another ad-hoc moves in with big plans for replacing audioanimatronic presidents with astonishing brain downloads (you really are Lincoln for a moment!). That's when Jules gets killed. As soon as he's reloaded, he turns into a loose cannon. He's sure he knows who killed him, is just as sure something underhanded is going on, and in pursuit of justice, he manages to ruin his reputation, his girlfriend, and his whuffie stock.

Is he right about who's to blame? Does he get his whuffie and girlfriend back? Is justice served?

That would be telling! Read it yourself. If you've been to Orlando (or dream of going), you'll have fun.

With **Touchless**, Russell Davis gives us a wistful romance that has some charms, but is nevertheless a bit hard to accept. The problem is that the protagonist, Drake Avery, is in his eighties, but does not *feel* so old to the reader. Mentally, he's as spry as a forty-year-old, and though the octogenarians I know may feel that mentally young, they don't strike others so. They're forgetful, for one thing, and they talk a lot about their various aches and pains.

Not Drake. His fifty-five-year marriage ended in a car crash. With her consent,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

he had his wife and true love frozen by ImagoTech to await revival and repair. And for the next seven years, he hovered at the side of her icebox, waiting.

Now the folks at ImagoTech are telling him he can have her back for a day as a virtual avatar, after which she will be dead forever. The temptation is real, for he misses her terribly, but he nevertheless refuses to cut off her chances. So ImagoTech offers him a free physical, and then informs him he has but months to live.

The reader need not wonder what is going on, for Davis makes it clear that ImagoTech's chief is a thoroughly unscrupulous fellow who will stop at nothing to get results that will draw money from investors. He *needs* success, and he will let nothing stand in his way. Not Drake, and certainly not Mercedes Bond, the suspicious newspaper columnist who starts off trying to use Drake to get at the company and quickly finds him appealing in a very different way. Trouble looms, and of course a solution.

Wistful, romantic, charming. It's all of that, but I think it would have worked much better if Drake Avery were twenty years younger.

In December 2001, I reviewed *Mars: The Lure of the Red Planet*, in which William Sheehan and Stephen James O'Meara documented our obsession with Mars, including the science fictional aspect of that obsession. Now we have Oliver Morton's **Mapping Mars: Science, Imagination, and the Birth of a World**, which takes a rather different approach. Morton's emphasis is on the physical image of the planet, and he covers the historical, the artistic, and the scientific, with loving attention to maps and mapmakers, notably those who turned *Mariner* and later photographs into portraits of the Red Planet in some ways more detailed than the maps of Earth (which perforce ignore much of the surface—it's underwater!). A history of map-making is of course also a history of discovery, of image-making and image-processing, of satellites and fly-bys, of landings and dreams of future missions and terraforming, and perhaps above all, of people.

It can also be an invitation to debate. Consider this passage, right at the end as he considers what we may make of that world in our solar system most like Earth, beginning when we sow soil and plants: "Planetary protection be damned, I see [a rose] dropped from the greenhouse to the soil below. There the UV and peroxides will work their dark magic [and] if the greater changes come, then, by and by, the . . . carefully charted constellations of micro-oases will come to life like a vegetable empire. . . ." This seems bound to inflame those extremists who believe all pristine environments—even those that are barren—must be walled off from human impact.

Morton is a gifted writer with a host of credits. He tells the tale cleanly and elegantly, even rising to the poetic at times, which makes his history a very engaging experience. He is also a visionary who dares to say what some do not.

Sometimes I wonder why a book doesn't get advertised in the SF magazines. For a case in point, look at **TechTV's Catalog of Tomorrow**. It has a wondrous array of short essays on new techno-gimmicks that just might (or might not) redefine our lives in a decade or two. There are smart clothes, smart cards, smart roads, smart houses, and smart appliances. There is gene tech in medicine and food, artificial intelligence and artificial life, nano and quantum and biochemical computing, nanobots and robots. There are prospects for education and energy, architecture and transportation, and a great deal more.

Each topic gets a glossy essay by a researcher or writer, complete with suitable diagrams, drawings, photos, and a few thought-provoking questions. The tone is bright and optimistic, just a bit

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

like those 1950's articles that promised a helicopter in every garage and electricity too cheap to meter, but tempered by some judicious caveats and cautions.

I find the book particularly interesting because I started teaching a course in emerging technologies in Fall 2002, using material from recent issues of *Technology Review*, *The Communications of the ACM*, and a few other magazines. Much of what I covered in the course is also here, so the book is about as up to the minute as possible. Will it stay so long enough for me to use it in another run of the course? I hope so!

Meanwhile, here's a glimpse of the possible future in a very readable format. SF readers can use it for edification, entertainment, and checking out the pipe dreams of their favorite writers. SF writers . . . well, they're already heading for the bookstore.

What does a career look like?

With many or even most elder writers, the answer has to be something like "a pile of books and magazines." If you insist on pictures, then you can spread out the covers for the cover and interior art. Only rarely do you have a writer whose prolificity, popularity, and gift for image have led to anything like Jerry Weist's **Bradbury: An Illustrated Life: A Journey to Far Metaphor**.

Weist has been a Bradbury fan for three and a half decades. He began a long and friendly correspondence in 1968, and throughout the years he collected artwork associated with Bradbury, including drawings done by Bradbury himself. In due time, Weist did some research and wrote this biography. It begins typically, with Bradbury's childhood, with photos of the writer-to-be and one of his childhood homes accompanied by reproductions of book and magazine covers, magazine interiors, comics ("Buck Rogers," of course!), and movie posters and stills that influenced the boy. There is the early Bradbury artwork for fanzines; early poetry; the first pulp stories, with their illustrations; the shift to the slicks (*Maclean's*, *Esquire*, and *The Saturday Evening Post*, all in 1950), and artwork of a very different flavor from that of Hannes Bok and Kelly Freas. The books are here too, in a host of editions. So are radio and TV and the movies (complete with portions of the journal kept by Francois Truffaut while filming "Fahrenheit 451") and theater. And if you want to know how Bradbury handled seeing his stories ripped off by EC Comics, that too is here. So are *Cliff's Notes on Bradbury's Works* and a generous sampling of Bradbury's own artwork.

Weist has provided sufficient narrative to tie the various parts together, but the bulk of the book and most of its continuity are provided by the vast array of illustrations—quite enough to provide the answer to my question, "What does a career look like?" and more than enough to justify the book's title.

They also provide a very nice nostalgia trip through one's memories of meeting Bradbury's work and favorite Bradbury stories and books for the first time, as well as through the bulk of the twentieth century's experience with SF.

Eat at home next Saturday night. Spend the money on this. You'll be glad you did.

Bradbury began writing about the same time that the "hard SF" tradition was getting its start in the 1930s. Perhaps fortunately for him, he was never an exponent of hard SF. His career blossomed and bloomed while hard SF lost whatever centrality it had in the SF genre in the 1940s.

Yet hard SF did continue. In *The Ascent of Wonder* (reviewed here in December 1994), David G. Hartwell and Kathryn Cramer surveyed the history of the tradition from Poe onward, saying that, "Hard sf is about the beauty of truth . . . the emotional experience of describing and confronting what is scientifically true. . . . Because hard sf is a

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

literary form demanding of both its writers and its readers significant amounts of scientific knowledge as well as previous reading in the genre, it has continued to yield a disproportionate number of the central images common to all forms of science fiction. . . . [H]ard sf is the core of all science fiction. . . ."

They could say this about a portion of SF that had been out of favor for fifty years? Well, by the 1990s, hard SF had become both popular and fashionable once more, espoused by the likes of Stephen Baxter, Greg Egan, Gregory Benford, Nancy Kress, the late Charles Sheffield, Allen Steele, and many more. Since then the subgenre has flourished enough to deserve a book for its recent history. That is, it deserves **The Hard SF Renaissance**.

Are there differences between the new hard SF and the old? The science has of course moved on, but there are more profound differences to consider. Hartwell and Cramer remind us that the old hard SF tended to be rather right-wing, pro-military, adventurist, and human supremacist. Much of the new leans more to the left and is thus more critical in its stance toward politics and the uses of technology. Yet it remains adventure-oriented, and there has been something of a merger of hard SF (shifting away from the problem-solving approach of Hal Clement and his ilk) and space opera (shifting away from the formulaic hackwork that once defined that term).

Do such discussions give you the pip? Never mind, then. The book remains a massive compendium of stories from the last fifteen years. You'll love it—and if you bought *Ascent of Wonder*, this one is an essential companion. ■

MOVING?

Please send both your old and new address (and include both zip codes) to our subscription department:

ANALOG
P.O. Box 54027
Boulder, CO 80322-4027

or fill out the change-of-address form on our website:

www.analogsf.com

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

BRASS TACKS

Dear Messieurs Burns & Schmidt:

[Re: "Green Light, Red Light" by Stephen L. Burns, in the 12/02 issue] I can foresee one wee stumbling block to installing SafeScan units hither and yon—at least in America—and I would have expected at least Attorney General Luvadis to have picked up on it: civil liberty violations of fanatics who haven't hurt anyone. Yet.

This country has a legal principle, "presumed innocence until proven guilty." Yes, this principle tends to get trampled in time of war and Burns posits that our nation will be at war, presumably the War Against Terror espoused by the current administration. Yes, many murderous terrorists are fanatics. That does not mean that every fanatic has or always will commit murderous acts. What of those who haven't, for whatever reason?

I'd expect the National Association for the Advancement of Fanatic People to file lawsuits or stage protests every time someone totally consumed with, say, preventing loggers from harvesting old-growth forests at all costs (I am a Sierra Club member) is "discriminated" against solely because her obsessive mental state sets off SafeScan units. The NAAFP might even argue that Thomas Olds' insane over-commitment to protecting America is no reason to keep him from boarding a commercial aircraft or filling a government appointment.

Richard M. Boothe
Los Angeles, CA.

The author replies . . .

If there were such a thing as a SafeScan, could it be quickly and painlessly deployed? There certainly would be many people who would push for it. As you point out, Mr. Boothe, there would also be those who opposed it—perhaps even violently. And as the story hints, we may not be able to predict who will be on which side.

My jaundiced view of history suggests that there always seems to be a good excuse for the rights of certain people to be cut back just a little (and of course only temporarily), and all too often it is war—either covert or overt—cited as a reason for these "necessary patriotic" curtailments. Quite often such measures don't meet with half the backlash they deserve. After all, as long as you're not the one being wiretapped or ghettoized or interned or profiled or otherwise seeing your rights evaporate, it's easy to let such measures slide. After all, there *is* a war on, right?

Just as there is never a shortage of those ready to roll back rights, there are always those ready to take rights beyond the edge dictated by logic or decency or sanity, into places which will make most everyone else want to put limits on those rights. One task of civilization is to find a rational standard. So, for instance, gay people get more rights (and about time) whereas pedophiles do not (again, about time).

"Green Light, Red Light" takes one side in a situation more black and white than life usually hands us, and posits machinery more perfect than we usually manage, but the essential point it makes—that fanaticism of *all* stripes is the enemy of civilized people, and if we

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

could identify *them* then maybe the rest of us would be safer—is one I'll stand by.

As for your splendid NAAFP, I don't doubt that such a thing would spring into existence, and I can only imagine how much fun they'd have trying to charter transportation to rallies and demonstrations.

The story didn't really say how such a device would be implemented, or how those who failed the test would be dealt with; Olds kept his job after setting off the alarm. And therein lies a spiky contradiction: we are back to possibly curtailing the rights of one particular group for the welfare of another. Because we are at war . . . with fanaticism.

Maybe you didn't see where I drew the boundary between passion and idealism, and fanaticism, but there is one, and it was stated. The line you use, "at all costs" is a telling one. An idealist would chain him or herself to a tree and face a bulldozer to save it, where a fanatic would poison the drinking water of a town where some loggers happened to live. Being willing to die for your beliefs doesn't make you a fanatic. Being willing to kill innocents does.

I am beginning to believe that fanaticism is not an ideological stance, but a genuine pathology. I sure wish we had a cure.

Stephen L. Burns

Dear Editor,

[Re: "Voices" by Charles L. Harness, in the 12/02 issue] I am truly shocked that you would dare to publish such a blatant knock off of O. Henry's wonderful story "The Gift of the Magi." Whoever this author is, he apparently has no original story lines of his own. I cannot believe that any editorial staff would profess not to know of O. Henry's great story, even if they haven't read it themselves (and they should!). This author even went so far as to have the Tex doll give the Marie doll a comb for her hair, exactly as O. Henry did in his story.

I could not believe that I was reading such plagiarism in a professional magazine. Shame on you!

Marilyn Fisken

I'm sorry you found "Voices" shocking, but you've missed the point. Far from being "plagiarism" or a "blatant knock off," it's an homage to O. Henry and his story, which is so well known that both the author and I assumed everybody would recognize it—and as a reminder in case one was needed, the author even included a reference to its origins. We hoped that readers would also recognize that this was *an original story line* about *the O. Henry story, like the toys, finding a new use so long after its creation that the original story and its origins were no longer clearly remembered. As for Harness's having "no original story lines of his own," evidently you're not familiar with the rest of his work, which includes some of the most original you'll find anywhere.*

The editors of *Analog* and *Asimov's*:

Both *Analog* and *Asimov's* engage in a practice that I deplore, namely running a novel-length story as a series of ostensibly unrelated novelettes or novellas. Recent examples: In the December *Analog* we have Wil McCarthy's novelette "Garbage Day," whose last paragraph reads:

"This isn't over, he thought. But for now, it is."

If that's not a clear signal, along with the fact that the action is left hanging, that there will be one or more sequels continuing the story, I don't know what is.

In the meantime, the December *Asimov's* has Allen M. Steele's "Glorious Destiny," which we are informed is the last section of the author's novel *Coyote*. This one is especially egregious, because all the previous stories in this series have been more or less complete, with some sort of closure, while this one again

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

leaves us in mid-story. Thus it's an example of another pet peeve of mine, namely leaving a novel incomplete, so the reader will feel compelled to buy the next book in the series. How Art serves Commerce!

But back to my main point: If a novel-length story appears as a serial, the episodes follow at one-month intervals, and each episode after the first starts with a synopsis of the story thus far, even though it isn't really necessary, since it's only been a month since we read the last episode. But if it appears as a series of separate stories, they may be months apart, with plenty of time for the reader to forget what's going on; however there is no synopsis. In *Analog*, we're told at the end of the story (not the beginning!) where to find the previous episodes, but *Asimov's* doesn't even do that much for the reader.

Please stop this practice. You could just as well run these stories as serials. I have no objection to that.

One more unrelated request: Please put the letters column back in *Asimov's*.

Bruce M. Foreman

I'm sorry you see it that way, but in fact we try to make sure each story wraps up a sufficiently self-contained piece of action to be understood and enjoyed as an independent story. The related stories are listed only because some readers have expressed an interest in going back and rereading related stories. We list them at the end because we suspect listing them at the beginning would make some readers think they're prerequisites and they have to skip this story if they didn't read the earlier ones. We try to make sure that's not the case.

Dear Dr. Schmidt:

I just read the editorial in the December 2002 issue. I don't buy the creationists as scientists and I doubt I will buy this new version either (haven't had time to look up your recommended reading so I can't be sure). However, the argument you make about complexity is flawed. You claim they are in infinite regress because "if we're so complicated that we must have been designed by a greater intelligence, where did that greater intelligence come from?" They may be in an infinite regression, but you haven't proven it. You have an implicit assumption that there is a direct and necessary correspondence between complexity and intelligence. Maybe there is, but is it true by definition or does it require proof? If it is possible to have a greater intelligence which is less complex than we are, then your argument is false. As a devout agnostic I doubt their point, but I'm not convinced by your argument either.

Neil Garston

Complexity does not necessarily imply intelligence, but intelligence, by the nature of what it must do, does seem to require complexity. If you can show a plausible and logical way around that, I may revise my views; but unless and until you do that, I'll stand by my argument.

Dear Dr. Schmidt:

"Intelligent design" must result in recursive intelligences and therefore cannot be true. Interesting. If the amino acids found in the "primordial soup" of the experimenters had become alive, you would have a point. The creators of that new life would have certainly been intelligent, but just a certainly were not the supreme intelligence.

The fact, unspoken though it may be, is: the "intelligence" in "intelligent design" is God. "In the beginning was the Word, and the Word was with God, and the Word was God." (John 1:1, RSV). You stated, quite correctly, that it is impossible to comprehend the truly infinite. The quote is a case in point.

The truths of logical postulates are easy enough to ascertain when agreed upon terms of reference are available.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

But, where matters of faith differ, there are few, if any, commonalities, and this is a matter of faith. One side contends one omniscient and omnipotent entity is impossible, without a shred of proof the other side will accept. The other side says that such an entity can exist and He does exist; also without any proof the other side will unconditionally accept. Interesting how this proves nothing more than Theism and Atheism are really dependent on faith.

John Jarrell
San Antonio, TX

The "intelligent design" people are claiming to use logic to make their case convincing. For the reasons I pointed out, the logic does not wash. It has an internal contradiction—and that has nothing to do with faith.

Dear Stan:

All the arguments for intelligent design that I have read dwelt exclusively on difficulties they find with evolutionary explanations. They never present a theory of their own as to why the "designer" made the choices they claim "it" made.

We can cite J.B.S. Haldane's remark that God must have an inordinate fondness for beetles as just one example.

The ancient advocates of intelligent design weren't so shy. The reason God made ants was to teach humans not to be lazy. The purpose of the rainbow is to teach us that the next time God destroys the world, it will be by fire, not by water.

If the advocates of intelligent design were serious, they would try to explain the features of the world in terms of the designer's purpose in making particular decisions. Maybe they would hope to make a theory with more predictive power than present science by framing it in terms of divine purpose.

John McCarthy
Stanford, CA

* * *

Dear Stanley,

I have read your editorial "Design Flaw" (December issue) and wish to make a few comments. William Paley, an eighteenth century English theologian, originated an argument for the existence of God called the argument by design, the teleological argument, or the "watch and the watchmaker" argument.

Briefly, it says that nothing as complex as a watch could have arisen by chance. It had to have been designed by man. Therefore, since man is more complex than a watch, then he, in turn, is designed by a Higher Power. The argument hearkens back to an earlier time when we knew less about ourselves (and the Universe) than we do today. Since it disregards evolution, it's popular with the creationists. However, it's a weak argument, really more like a trial balloon, and easily shot down—which you did.

I know of no religion which worships a more complex God. Indeed we are attracted by the simple. How many kept using complicated and noisy adding machines after pocket calculators came out? A mathematical proof that is long and complicated is quickly forgotten when a simple and elegant one is found.

It's true that we are more complicated than say, an amoeba, and that with that complexity come many powers and advantages. Over a long period of time we have adapted quite well to a specialized environment—Earth. However it's easy to imagine a slight change of conditions that would work against us. A burst of radiation, for example, might wipe us out and leave the amoeba standing.

Speaking as a Christian, all arguments for the existence of God are flawed since they leave faith out of the picture. One cannot approach God by persuasion and logic alone.

Dan Shine
Cincinnati, OH

P.S. I notice that your editorial doesn't contain the word "God," capitalized or

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

not; nor does it contain the broadly generic "deity" or "creator." I'm fine with that, but it does seem a bit puzzling, because one can, for the sake of argument, use terms and not imply a belief in their existence.

A pocket calculator is not simpler than an adding machine—it just uses very small, quiet parts (but lots of them!). As for your PS, it was not necessary to use those terms and seemed prudent to avoid them because of the more specific meanings and heavy emotional loadings they carry for many people.

* * *

Dear Stan,

My December issue of *Analog* just arrived and, as usual, I was reading your editorial column first. I found what I take to be a most unfortunate "typo" near the top of page 5, where you describe Michael Behe's argument. Behe talks about "irreducible complexity," not "irreproducible complexity." A careful reading of your description shows that something is amiss, but someone unfamiliar with the ID arguments might be inclined to think "irreproducible complexity" a rather odd thing. . . .

Roland B. Roberts
Forest Hills, NY ■

IN TIMES TO COME

Our cover novelette for June is one of the late Lloyd Biggle, Jr's last tales of the Interplanetary Relations Bureau: "Of the Zornler, By the Zornler." It seems self-evident to many humans (and perhaps to other sentient beings as well) that *their* way of life is the best for everybody. It seems almost as evident to some, who've thought about it a little more, that that may not be true, and they should be cautious about imposing their preferences on somebody else. But does either group really *know*—if they haven't tried the experiment?

Kyle Kirkland's fact article offers a preview of an intriguing new development in pharmacology: "Personalized Drugs: The Future of Pharmacogenomics." Any MD knows that not all patients respond equally well to a drug, and some individuals may even be killed by a prescription that saves someone else's life. So why not tailor drugs specifically for the patients who will use them? Recent advances in decoding the human genome may make it practical.

We'll also have the usual variety of other fiction, including new stories by such favorite writers as Ben Bova and Michael F. Flynn.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

CLASSIFIED MARKETPLACE

Advertise in the world's leading science fiction magazines with our Analog/Asimov's combined classified section. Ad rates per issue: $2.95 per word (10 word minimum), $125 per column inch (2.25 inch maximum). SPECIAL INTRODUCTORY OFFER: Buy two ads and receive a third ad FREE. Send orders to: Dell Magazines, Classified Department, 475 Park Ave. S., 11th Floor, New York, NY 10016. Direct inquires to: (212) 686-7188; Fax (212) 686-7414 or email: classifiedads@dellmagazines.com

ANNOUNCEMENTS

Writers, test your stories in a paying market. www.privategalaxy.com

AUDIO/VIDEO

Audiobooks, Niven, LeGuin, Willis, Baxter, Egan, Sterling, Reed, Etc. www.audiotexttapes.com

BOOKS/PUBLICATIONS

ACROSS THE THRESHOLD. *A science fiction novel.* Join me, Carl Kester, as I step across the threshold into a world of adventure and romance. US $13.00, in Canada C$17.00, all other countries US $17.00, postpaid. Available from: **J. Bode, P.O. Box 328, Markham, ON L3P 3J8 Canada**

www.stewartbooks.com

BUYING SCIENCE FICTION magazines, book collections. Will travel for large accumulations. Bowman, Box 167, Carmel, IN 46082.

CHRISTIAN SCIENCE FICTION print magazine and webzine. http://www.gateway-sf-magazine.com

Dumb and Dumber* meets *Star Trek in a hilarious new comic book series. www.GuysExploringSpace.com

Learn the Truth
Little-known Facts Revealed

Sci-Fi & Fact zine Alternative histories
Free Catalog and Samples
P A C, PO Box 2523, San Anselmo, CA 94979
www.pacificareacomm.com 415-259-0118

Novel: BEYOND THE TIME MACHINE; Mars Faces. http://us.geocities.com/bttm_book/

BOOKS/PUBLICATIONS

PUBLISH YOUR BOOK ONLINE, Third Millennium Publishing, a cooperative of online writers and resources, http://3mpub.com

www.rereadables.com. Online Used Book Store. Science Fiction, mystery and more.

Science Fiction Book Exchange – Buy and sell SF books and other genre merchandise online! Free Membership! www.sfbe.com

INSTRUCTION

SCIENCE FICTION WRITING CLASSES. Published SF authors teach Science Fiction Writing online at www.WritingClasses.com. Selected "Best of the Web" by *Forbes*. For FREE catalog call 877 974-8377.

MISCELLANEOUS

PLASTIC MODELS: Space, Sci-Fi, TV, movies, etc. Free Catalog, also buying/trading. Green's Dept. DL, Box 55787, Riverside, CA 92517. (909) 684-5300; (800) 807-4759; FAX (909) 684-8819; dl@greenmodels.com; http://www.greenmodels.com

STARFLEET, the International Star Trek Fan Association. 4000 Members worldwide. www.REGION2.ORG. REGION2RC@AOL.COM

UNUSUAL ITEMS

Alien Nature or Human Nature: Understand it all. The Truth? Can you handle the Truth? Find out at www.all2true.org and www.all2true.com. Also, you may find interesting things like back issues of *Analog, Asimov's* and *Aboriginal Science Fiction.*

CLASSIFIED ADS under this heading or any of the other 18 subject areas we offer can be very rewarding.

ANALOG SCIENCE FICTION AND FACT
Classified Department 475 Park Ave South, 11th Floor New York, NY 10016
Call: (212) 686-7188 Fax: (212) 686-7414 classifiedads@dellmagazines.com

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

UPCOMING EVENTS Anthony Lewis

16–18 May 2003
LEPRECON 29 (Phoenix area SF conference) at Embassy Suites Phoenix North, Phoenix AZ. Artist Guest of Honor: Larry Elmore. Local Artist Guest: Madame M. Media Technical Guest: Richard Coyle. Info: LepreCon 29, Box 26665, Tempe AZ 85285; +1.480.945.6890; lep29@leprecon.org; www.leprecon.org/lep29

23–26 May 2003
BALTICON 37 (Baltimore area SF conference) at Wyndham Inner Harbor Hotel, Baltimore MD. Guests of Honor: Steve Miller and Sharon Lee. Featured Artists: Omar and Sheila Rayyan. Featured Filker: Steve MacDonald. 2002 Compton Crook Winner: Wen Spencer. Registration: $45 until 30 April 2003, then $50. Info: Balticon 37, Box 686, Baltimore MD 21203-0686; +1.410.536.2737; bsfs@balticon.org; www.balticon.org

23–25 May 2003
CONDUIT 13: THE NIGHTMARE CONTINUES (Utah SF and Gaming Conference) at Wyndham Salt Lake City, Salt Lake City UT. Guest of Honor: Harry Turtledove; Featured Guest: L. E. Modesitt. Registration: $32 until 28 February 2003, $38 at door. Info: CONduit, Box 11745, Salt Lake City UT 84147 0745; +1.801.294.9297; conduit@conduit.sfcon.org; http://conduit.sfcon.org

23–25 May 2003
OASIS 16 (Orlando Area SF Society Convention) at the Radisson Plaza Orlando, Orlando, FL. Author Guest of Honor: Robert J. Sawyer. Artist Guest of Honor: Stanley Morrison. Filk Guest of Honor: Ann Morris. Registration: $25 until 1 May 2003, $30 at the door. Info: OASFiS, Box 940992, Maitland, FL 32794-0992; +1.407.263.5822; http://oasfis.org/oasis_16.html

30 May–1 June 2003
CONCAROLINAS 2003 (Carolina area SF conference) at Marriott Executive Park, Charlotte NC. Guests: Karen Taylor, Andy Duncan, Scott Nicholson, d.g.b. goldberg. Registration: $25 until 1 May 2003, then $35. Info: ConCarolinas, PMB 2004, 401 Hawthorne Ln., Ste. 110, Charlotte NC 28204; concarolinas@yahoo.com; www.secfi.org/concarolinas

28 August–1 September 2003
TORCON 3 (61st World Science Fiction Convention) at Metro Toronto Convention Centre, Royal York Hotel (and others), Toronto, Ontario, Canada. Guests of Honor: George R.R. Martin, Frank Kelly Freas, Mike Glyer. GoHst of Honor: Robert Bloch. TM: Spider Robinson. Registration: Attending CAD250/USD170, Supporting CAD60/USD40, Child CAD60/USD40. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition—the works. Info: Torcon 3, Box 3, Station A, Toronto, Ontario M5W 1A2, Canada; info@torcon3.on.ca; www.torcon3.on.ca [Note to US readers: first class postage to Canada is $0.60 for the first ounce.] ■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

6 Issues, Just $9.97!

Subscribe today to *Ellery Queen's Mystery Magazine* and you'll get every intriguing issue delivered directly to your door.

Ellery Queen's Mystery Magazine leads the genre in critical acclaim with more than 50 major awards and nominations just since 1990! With suspenseful stories from the honor roll of mystery and crime fiction's great writers PLUS mystery limericks, poems and cartoons, book reviews, and an occasional mystery crossword!

SAVE 40%!

To order by charge card, call toll-free:

1-800-333-3311

Outside the U.S.A.: 1-850-682-7644

BY MAIL

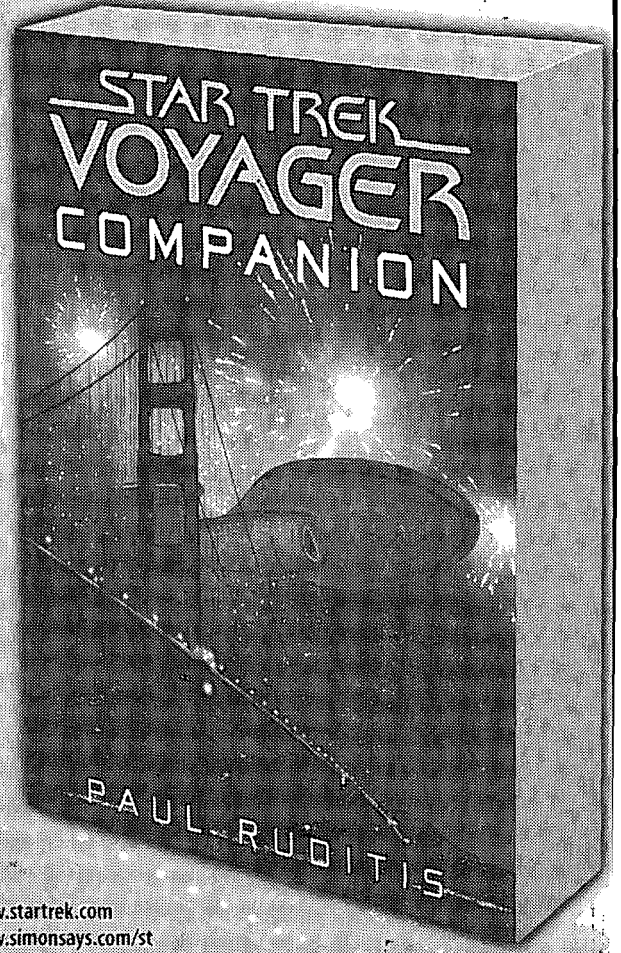
Ellery Queen, P.O. Box 54052,
Boulder CO, 80322-4052

Please allow 4 to 6 weeks for delivery of your first issue. Outside U.S.A.: Add $4 per year for shipping and handling. All orders must be paid in U.S. funds. *We publish a double issue once a year which counts as two issues toward your subscription. 5E10

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Relive the thrilling adventures in the Delta Quadrant with this must-have guide!

This is the only official, completely comprehensive guide to all seven seasons of the phenomenal series *Star Trek: Voyager*® —featuring favorite characters, plot lines, villains, episode summaries, and much more!



STAR TREK® BOOKS
Published by Pocket Books
A Division of Simon & Schuster
A VIACOM COMPANY

www.startrek.com
www.simonsays.com/st

™, ® & © 2003 Paramount Pictures. All Rights Reserved. STAR TREK and related marks are trademarks of Paramount Pictures. Pocket Books, Authorized User.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED